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XVII. *On the Occurrence of Flint-implements, associated with the Remains of Animals of Extinct Species in Beds of a late Geological Period, in France at Amiens and Abbeville, and in England at Hoxne.* By JOSEPH PRESTWICH, F.R.S., F.G.S. &c.

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	Page
§ 1. Introductory Remarks	277
§ 2. Sections at Abbeville and Amiens.....	282
§ 3. Nature and value of the evidence	294
§ 4. Geological Considerations	302
§ 5. Particulars regarding Hoxne.....	304
§ 6. General Conclusions	308
Appendix	310
(Maps, Sections, and Figures. Plates X. to XIV.)	

§ 1. INTRODUCTORY REMARKS.

FEW strata have been more extensively worked than the superficial sands, clays, gravels, and brick-earth belonging to the Drift or Pleistocene series, and a great number of cave-deposits belonging to the same period have also been carefully explored; nevertheless it is only in a few exceptional cases that the remains of man or of his works have been recorded as occurring in association with the mammalian and other organic remains so often found in such situations, and even these few exceptions have generally been viewed with doubt or else entirely rejected. The conclusion, in fact, that man did not exist until after the latest of our geological changes and until after the dying out of the great extinct mammals, had become almost a point of established belief†. Although resting mainly upon negative evidence and preconceived opinion, this prevalent belief was strengthened by the failure of the many ill-observed and dubious cases which had, from time to time, been brought forward. Owing to these circumstances there is little doubt that cases really meriting inquiry have been neglected or overlooked. To name only a few highly probable instances:—

In 1833, Dr. SCHMERLING‡ of Liége discovered in some caves in the valley of the Meuse, and at elevations of about 200 feet above the river, some bones of man associated with others of recent and extinct mammals: and he further subsequently

* Subsequently revised by the author, but without altering the essential facts, or extending the conclusions, of the original paper.

† Still the doctrine of the co-existence of man and of the great extinct pachyderms had been for some years partly accepted and taught by a few scientific men both in England and on the Continent.

‡ *Recherches sur les Ossements fossiles découverts dans les Cavernes de la Province de Liége.* Liége, 1833-36, vol. i. p. 52-66, and vol. ii. p. 176-179.

recorded the occurrence, under the same conditions, both of worked flints and of worked bones. Amongst the human remains were two skulls, one of which, found at a depth of 5 feet in the cave-earth, "was surrounded on all sides by teeth of *Rhinoceros*, *Horse*, *Hyæna*, and *Bear*:" the other was lying at the bottom of the deposit by the side of a tooth of an *Elephant*. The human bones, like those of the extinct animals, were mostly broken and fragmentary. They were all of the same colour and mixed together indiscriminately; and, according to Dr. SCHMERLING, there were no traces of the ground having, in those places, been artificially disturbed.

Several remarkable instances have been recorded in Germany, whilst in France the subject has from time to time found zealous inquirers*, and some important cases are still undergoing investigation.

About thirty years ago the Rev. Mr. M^cENERY, a Roman Catholic clergyman residing near Torquay, diligently explored the large and extensive cavern known as Kent's Hole, one mile east of Torquay. In the red loam, under the stalagmite floor, he found the bones of the *Mammoth*, *Tichorhine Rhinoceros*, *Cave Bear*, *Cave Hyæna*, *Horse*, &c.; whilst he also noticed, that, besides the remains of man with charred wood, and coarse pottery found scattered on the surface of the stalagmite, there also occurred in this red loam under it (though he himself seems to have doubted how far in true association with the remains of the extinct animals) worked flints of rude forms, and which he supposed to have been used as arrow-heads and knives. It was his intention to have published an account of his observations, with plates of the organic remains, and he had already, in conjunction with the late Dr. BUCKLAND, had seventeen quarto plates engraved, when his untimely death deprived science of the result of his valuable researches. For many years it was supposed that Mr. M^cENERY's MSS. were lost. A large portion of them, together with the plates, have been, however, recently recovered and published†, furnishing, although incomplete, an important addition to the history of cave-remains. On one of his plates (T, figs. 11, 12) are drawings of two flint-implements of larger size than the others, and approaching closely in form to the common Abbeville type (Plate XII. fig. 1), but the particulars concerning them are unfortunately missing. Mr. M^cENERY's observations were shortly afterwards confirmed by an able and experienced geologist Mr. GODWIN-AUSTEN, who described the cave in his paper on the "Geology of South Devon," published in 1840‡. In 1847 the Torquay Natural History Society determined on a further examination of the cavern, with the special object of determining the exact

* The number of alleged cases in the South of France is not inconsiderable. For full information upon many of these and on caverns in general, I beg to refer to the work of the indefatigable and veteran geologist, M. MARCEL DE SERRES, 'Essai sur les Cavernes à Ossements et sur les causes qui les y ont accumulés.' Paris, 1838. See also the valuable paper on Caves (*Grottes*) by M. DESNOYERS in C. D'ORBIGNY's 'Dictionnaire d'Histoire Naturelle,' where the question is discussed at length and with much ability. Of three alternatives this author suggests, he is disposed to adopt for the present the one which refers the association of the bones of man and of the extinct mammals to disturbances and mixture of the beds subsequent to their original separate deposition.

† Cavern Researches by the Rev. Mr. M^cENERY, edited by E. VIVIAN, Esq. London, 1859.

‡ Transactions of the Geological Society, 2nd ser. vol. vi. p. 444.

position of these flint-implements. After taking every care to avoid error, the conclusion these gentlemen arrived at was, that, although it appeared to them that the cave had been inhabited by man at a comparatively recent period, his remains of this latter date were distinct and confined to near the surface or to the upper part of the stalagmite, whilst certain flint arrow-heads of an anterior period were certainly found in the red loam, containing the bones of extinct animals, which underlies the stalagmite.

Such instances might be multiplied, but this at present is not my object. I now wish to draw attention to the particular and remarkable case which has led to this communication, and to give the geological evidence bearing upon the question.

In the year 1841, M. BOUCHER DE PERTHES, of Abbeville, an antiquary distinguished by his varied researches, his large and valuable collections, and by an indefatigable zeal and perseverance, discovered *, in some sand with mammalian remains from the village of Menchecourt, near Abbeville (Plan A, Plate X.), a flint rudely fashioned into a cutting instrument, somewhat resembling the old flint weapons known by the name of celts, yet having a peculiar type of its own; shortly afterwards two other specimens (each above 8 inches long) were brought to him, and subsequently a considerable number have been, from time to time, obtained from the same locality. In 1844 some excavations near the hospital of Abbeville exposed a fresh section of the drift. Following up the work, M. DE PERTHES discovered, at various depths of from 9 to 16 feet, in a bed of sand and gravel, from which he obtained specimens of the teeth of the *Elephas primigenius*, several flints more or less worked; and on the 7th of August the workmen found at a depth of 14 feet 4 inches a still more perfect specimen, $6\frac{3}{4}$ inches long by $2\frac{3}{4}$ broad,—a fact he had certified by an official “procès-verbal” (p. 263). At the end of 1844 similar discoveries were made at Moulin Quignon; and at a later period M. DE PERTHES obtained specimens of the same character from Mautort, Mareuil, Drucat, and St. Riquier, in the neighbourhood of Abbeville; while at Abbeville itself some excavations at the Champ de Mars furnished a much larger number of specimens. An account of these discoveries and of his general investigations was published by M. BOUCHER DE PERTHES in 1847, in a work entitled ‘Antiquités Celtiques et Antédiluviennes†,’ in which he announced his belief that the flint-implements occurred in beds of undisturbed sand and gravel in true association with the bones of extinct animals. This work abounds in illustrations; and sections of the beds, drawn by Dr. RAVIN, a most competent geologist, are given to show the position in which the flint-implements were found; while the evidence regarding this singular occurrence of worked flints was conscientiously discussed by the author, who concluded that they were the work of man, and that they were entombed, together with the remains of the great mammals, by the Deluge.

In 1854, Dr. RIGOLLOT‡ of Amiens, whose attention had been directed to the subject

* The possibility of such discoveries is stated by M. B. DE PERTHES to have occurred to him as early as 1826, and he broached the question in his work ‘Sur la Création’ (Antiq. Celt. et Antéd. vol. ii. p. 359–61).

† The work was originally published in 1846, under the title of “De l’Industrie primitive.” A second volume of the “Antiquités” was published in 1857. Paris: Treuttel et Wurtz.

‡ Mémoire sur des Instruments en Silex trouvés à St. Acheul près d’Amiens. Amiens, 1855.

by M. DE PERTHES' discoveries, ascertained that similar flint-implements were often found in a bed of gravel at St. Acheul near that city. He, also, after careful inquiry, expressed his conviction that the ground was undisturbed, and that these works of man were contemporaneous with the remains of the associated extinct animals. His paper contains an interesting account of the pits, with careful sections and good drawings of the worked flints, and the geological questions are more fully discussed.

These observations did not, however, attract the attention they deserved, and, with few exceptions, the discovery of M. BOUCHER DE PERTHES remained unknown to, or was considered inconclusive by, antiquaries and geologists both in France and England.

The question was in this state when attention was again directed to it by the eminent palæontologist Dr. FALCONER*, and received especially a fresh impulse by his discovery of flint-implements associated with the bones of extinct animals in Brixham Cave,—then in course of exploration at his instigation under the auspices of the Royal Society,—a fact announced by Mr. PENGELLY to the British Association in 1858. As the report on this important inquiry has not yet been presented to the Royal Society, I now merely mention this fact, to instance the weight such evidence, so carefully worked out, had in modifying previously received and generally entertained views, and in inciting further research.

It was not, however, until I had myself witnessed the conditions under which these flint-implements had been found at Brixham, that I became fully impressed with the validity of the doubts thrown upon the previously prevailing opinions with respect to such remains in caves. At the same time, although I now felt more satisfied, from the strength of the concurrent testimony and from my own observation, that these works of man did actually occur in true association with the remains of extinct mammalia in ground not artificially disturbed, still a doubt was left on my mind as to their contemporaneity. For let us suppose, first, a cave into which the bones of the extinct animals were introduced and imbedded in the red clay or loam; secondly, that the mass was then sealed up, as it were, by a layer of stalagmite; thirdly, that man afterwards frequented the cave, strewing the stalagmitic floor with his works. If, then, from any natural cause,—such for example as earthquake movements, the influx of a body of water, or any other cause tending to disturb the cave,—the stalagmite floor became broken up and the whole ground moved afresh, we might have the remains of the two periods commingled and covered up in process of time by a fresh coating of stalagmite. I would not offer this as a sufficient explanation in many cases†; but that it is a possible

* Dr. FALCONER's important researches in Sicily during the winter of 1858-59 still further stimulated inquiry. In a communication made to the Geological Society on the 4th of May 1859, an account is given of the "Grotta di Maccagnone" near Palermo, in which, besides an abundance of the remains of the *Hippopotamus* and *Elephant*, mixed with recent species of *Helix*, Dr. FALCONER announced the discovery, in portions of the same bone breccia, of small flint-implements resembling in form the obsidian knives from Mexico and the flint knives found in the old barrows of this country.—Quart. Journ. Geol. Soc. vol. xvi. p. 99.

† For another explanation see Mr. Babbage's "Observations on the Discovery in various Localities of the Remains of Human Art mixed with the Bones of Extinct Races of Animals," Proceedings of the Royal Society, May 1859, vol. x. p. 59.

case, is evident from the fact that in some caves pieces of a broken stalagmite floor are actually mixed up with bones of the animals in the loam or clay under a second and newer floor of stalagmite*.

To clear up my doubts, I resolved to take an early opportunity of examining an open section I had long intended to visit in consequence of its interest in a purely geological point of view, but now more particularly attractive in connexion with the important question raised by M. BOUCHER DE PERTHES. This section, which is exposed in digging for sand and loam at Menhecourt near Abbeville, is noted for its fossil remains of *Elephant*, *Rhinoceros*, &c., which are there found associated not only with many *land* and *freshwater shells*, but also with several species of *marine shells*. It has been described both by M. RAVIN† and M. BUTEUX‡, in their excellent memoirs on the Geology of the Department. In a note to his description, M. BUTEUX adds that M. BOUCHER DE PERTHES had discovered hatchets and other implements in flint in the same beds, but that “this discovery may be classed with others of the same sort the exactitude of which has been contested,” &c.,—a verdict generally concurred in at the time§.

The subsequent publication of Dr. RIGOLLOT's interesting memoir again led to further discussion and inquiry by several eminent French geologists, especially M. HÉBERT and M. BUTEUX, who now frankly stated the facts relating to the discovery, but without indorsing them with the sanction of their authority or expressing any decided opinion||. There could not have been more fitting and able geologists than these, my colleagues of the French Geological Society, to conduct any such inquiry, and I might well have left the matter entirely in their hands had they pursued the investigation further. The subject, however, seemed neglected, and no further steps, that I am aware of, were being taken to investigate it.

In the autumn of 1858 Dr. FALCONER, in passing through Abbeville, examined M. BOUCHER DE PERTHES' collection, and satisfied that the flints (the *Haches*) were really worked by man, and bore all the impress of age, and that M. DE PERTHES had probably taken a correct view of their geological position, he wrote me a letter describing the great interest of the collection, and urging me warmly to visit the district, and to see the sections described by M. DE PERTHES. Feeling the desirability, in a question of this importance, of having the testimony of several competent witnesses, I proposed a visit, last Easter, to Abbeville and Amiens to some fellow members of the Geological Society, with the intention of drawing up a joint report on the subject. Owing, however, to an

* This occurs, amongst other places, in some of the caves near Liége. *Op. cit.* vol. i. pp. 19, 29, 35.

† “Mémoire Géologique sur le Bassin d'Amiens,” in the *Mémoires de la Société Royale d'Emulation d'Abbeville*, 1834 et 1835, p. 197.

‡ *Esquisse Géologique du Département de la Somme*, p. 76. Amiens, 1849.

§ The non-acceptance of the same fact by M. le Viscomte d'ARCHIAC, in his elaborate and most valuable ‘*Histoire des Progrès de la Géologie*,’ vol. ii. p. 166, and by Dr. MANTELL, in his paper ‘*On the Remains of Man and Works of Art imbedded in Rocks and Strata*,’ 1851, shows how unsatisfactory the evidence was at that time considered.

|| *Bulletin de la Société Géologique de France*, 2nd ser. vol. xii. p. 112 and 254. *Mém. Soc. Impériale d'Emulation d'Abbeville* for 1857, p. 570.

unavoidably short notice, I had to start alone, although I was afterwards joined by my friend Mr. JOHN EVANS, F.S.A. *

Thus the inquiry had not the advantage of all the co-operation for which I had hoped; nor was I more fortunate in Paris, for my friends there, upon whom I called in the hope that they might join me, were absent in the country. On my arrival at Abbeville, M. BOUCHER DE PERTHES at once accompanied me to the several localities he had described, opened his interesting collection for examination at my leisure, and placed me in full possession of all the facts bearing upon his discoveries. To M. MARCOTTE, Curator of the excellent local Museum of Abbeville, I am indebted for information on many points respecting the organic remains and the recent fauna of the district. To some members of the engineers "des Ponts et Chaussées" I have to express my obligations for the various levels taken through the instrumentality of M. BOUCHER DE PERTHES. At Amiens I was most kindly assisted in the furtherance of this investigation by M. CHARLES PINSARD, a Member of the "Société des Antiquaires de Picardie," who liberally placed at my disposal a small but special collection of teeth and bones he had found at St. Acheul, and obligingly undertook the determination of several levels which were not given on the Ordnance Maps of that district. See Appendix (F).

§ 2. SECTIONS AT ABBEVILLE AND AMIENS.

Abbeville and Amiens are both situated in the valley of the Somme, the first at a distance of about fourteen miles, and the second of forty-one miles, from the sea. The surrounding district consists of gently undulating elevated plains of chalk, capped here and there by outliers of tertiary strata, and elsewhere partly bare and partly covered by a few feet of fine light red or yellow loam and clay, in places mixed with angular fragments of flints. The river valleys are narrow, often exhibit on their flanks thick deposits of loam and gravel, while the middle is usually a flat level of marsh and peat† overlying gravel. The loam, brick-earth, or loess forms a very marked feature in this usually bare chalk district, being principally accumulated in thick irregular and local masses on the sides and flanks of the valleys. This is especially the case for some distance both above and below Amiens, as well as up the greater number of the lateral valleys. It extends to various elevations. A bed of gravel also spreads over some of the lower hills flanking the valley of the Somme. For full particulars of the geology of the district, I beg, however, to refer to the works before quoted of M. BUTEUX and Dr. RAVIN.

The fall of the Somme valley‡ is very gradual, its elevation at Abbeville above the level of mean tide of the sea at St. Valery being 18 feet, at Amiens 60 feet. Between these towns the mean width of the valley, which varies but little, is rather less than a mile. The hills rise gradually to heights generally of from 200 to 400 feet, and nowhere

* Mr. EVANS also has given (June 1859) to the Society of Antiquaries, an account of our visit to Abbeville and Amiens, discussing the subject from an antiquarian point of view. His paper is in course of publication in the 'Archæologia,' vol. xxxviii.

† The silt and peat in the valley of the Somme varies in thickness from 10 to 30, or even nearly 40 feet.

‡ The mean level of the river is about 8 feet below that of the valley at Abbeville.

exceed 600 to 650 feet above the sea-level, and that more in the interior of the department*. The pits in which the flint-implements have hitherto been observed are all in or near the main valley of the Somme (Map, Plate X.).

Abbeville.—According to M. BOUCHER DE PERTHES, the principal localities where flint-implements have been found are—the village of Menchecourt, a suburb at the foot of the hill on the N.W. side of Abbeville,—the town of Abbeville,—the rising ground on the S.E. side of the town on which is situated the Champ de Mars, the Moulin Quignon, and the suburb of St. Gilles—and Mautort† on the W. (Plan A, Plate X.).

Menchecourt has been long celebrated for its mammalian remains, of which a large collection was made by M. BAILLON. Many of these specimens were examined and described by CUVIER‡. The chalk hills rise immediately above the village to the height of 214 feet. They are capped to the depth of a few feet by drift loam and clays: the upper part of their slope is bare, and the lower part is covered by the deposit we have to describe, and this passes under the recent peat and silt deposits of the valley. One of the largest of the Menchecourt pits is that of M. DUFOUR, towards the further end of the village, and on the right hand side in proceeding from Abbeville. An extensive section of the upper beds is here exhibited. The lower beds (those below *level of ground* in figs. 1, 2), of which *d* is worked during the winter, I had opened out by trenches. The one in fig. 2, which afforded the evidence of most interest, was excavated near the entrance of the pit where the upper beds are thin. The variation in the thickness of the strata is shown by another section I took at M. DELIQUIERE's pit (fig. 1), situated on about the same level, and at the further end of the village.

* The heights of the hills on the small outline Map in Plate X., are taken from the admirable maps of the "Département de la Guerre;" I have, however, changed the datum-line from the level of mean tide at Havre to the same level at St. Valéry at the mouth of the Somme, which is 7 feet higher, and reduced the heights to English feet. I have adopted the same datum-line in the plans and sections.

† It is only lately that I have had the opportunity of visiting this locality, which is $1\frac{1}{2}$ mile W. of Abbeville, and on the opposite side of the Somme. There are two pits at Mautort where flint-implements have been found, one, a shallow one, no longer worked, in the valley near the church, and another one on the side of the hill on the road leading to Moyenville, and at a height probably about equal to that of Moulin Quignon, or about 90 feet above the valley. The section, which was badly exposed on the two occasions when I was there, consists probably of—

	ft.
1. Brown sandy clay and a few angular fragments of flint	6
2. Sub-angular ochreous and ferruginous flint-gravel	4
3. White and yellow sand, irregular	3
4. Coarse light sandy, chalky, and marly flint gravel;—no bones: flint-implements said to be met with at a depth of 6 to 8 feet;—reposing upon an irregular surface of chalk.....	12?

The flint-implements here are remarkable for their bright white colour. The bed of gravel ceases at this elevation, but the hill rises to a height of 252 feet, showing chalk with a slight covering of red clay and flints. I also visited Drucat and St. Riquier. Near the former place there is a bed 30 feet thick of sand and gravel, but we could hear of no flint-implements or fossil bones. Nor were we more successful at St. Riquier, but our visit there was too short. (See *Antiq. Celt. et Antéd.* vol. ii. p. 118 to 122.)—Sept. 1860.

‡ *Recherches sur les Ossements Fossiles*, edit. of 1821, vol. i. p. 110; vol. ii. p. 50, 111; vol. iv. p. 96.

Sections in the pits at Menchecourt near Abbeville.*

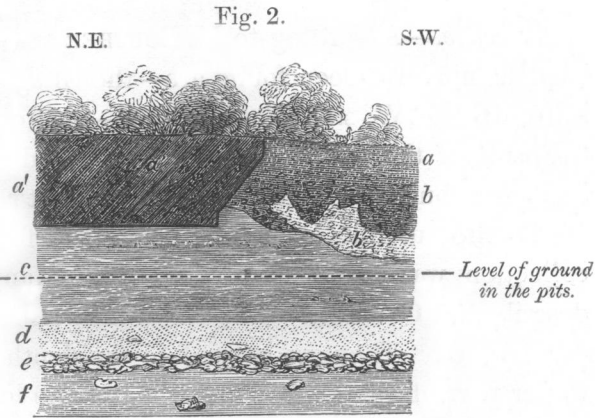
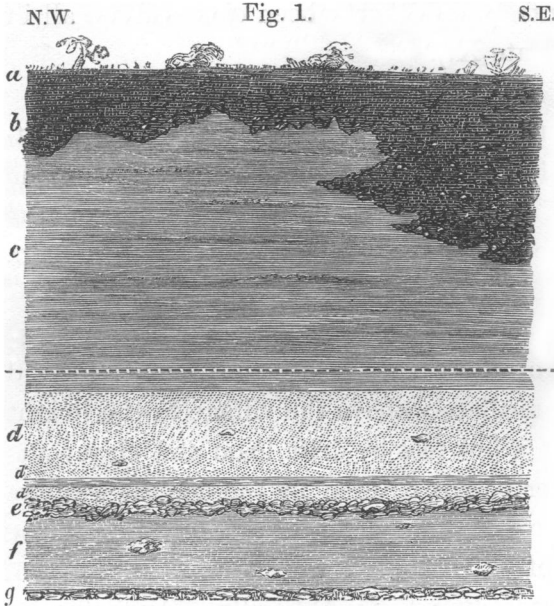


Fig. 1.	Fig. 2.
ft. in.	ft. in.
0 8	1 0
4 10	4 0
15 0	6 0
7 0	2 0
0 8	1 0
4 6	3 0
32 8	17 0

- a. Surface soil,—(and made ground, a')
- b. Brown clay mixed with siliceous sand, in which is imbedded a greater or lesser number of fragments of flints, mostly sharply angular, and weathered white. It is unstratified and very irregular in structure and thickness, its base forming a very indented line on c. It follows the slope of the ground. At places (more usually towards the base) it is mixed up with a mass of chalk rubble and flints, b': sometimes the two form more distinct beds, b always being the upper one.
- c. Light buff-coloured, fine and uniform loam (loess), with a few very thin seams and patches of small gravel, flint fragments, and of chalk grit and rubble. Very calcareous; a few small calcareous concretions. Bedding just apparent (*Sable à plaquer* of the workmen). Base wavy. *Land-shells*, *bones*, and *flint-implements* ...
- d. Fine white sharp siliceous sand, with fine chalk débris and a few scattered large sub-angular flints and subordinate beds of light-coloured clay or marl, d'. (*Sable aigre*.) *Freshwater shells* often numerous and perfect, but very fragile; some *marine shells*; *bones* common, chiefly on the gravel at base: *flint-implements* ...
- e. White and ochreous sub-angular flint-gravel and large flints but little worn, with some tertiary flint-pebbles, and chalk pebbles†, in sand same as d; *shells* and *bones* as in d, but with a larger proportion of *marine shells*, (also worked flints?), are found in the interstices between the flints
- f. Light-coloured very fine sandy marl, with a few large unworn flints here and there; in places it is indurated and very hard. (*Sable gras*.) *Shells*, chiefly land species
- g. Ochreous sub-angular gravel, just reached in section No. 1 :—stopped by water.

The ground, in M. DUFOUR's pit, which is on the level of the village road, is 24 feet above the highest tides of the Somme at Abbeville and 42 feet above the mean level of the sea at St. Valéry.

* All the woodcut sections are on one vertical scale, viz. 1 inch = 12 feet.

† I found also two very small sub-angular and rolled fragments of some old crystalline rocks.

The gravelly clay *b* becomes more persistent and thicker as it slopes down into the valley. The loam *c*, on the contrary, is cut off gradually by *b*, and thins out: its maximum thickness is from 25 to 28 feet. The sand *d* varies from 2 to 8 feet, and is thickest about the middle of the pit. The gravel *e* is of a nearly uniform thickness of $\frac{1}{2}$ to 1 foot; it apparently does not range up to the chalk, which, at the end of M. DUFOUR's pit, has been met with directly under the sand *d*. Of the marl *f* I examined but few sections, as the diggings do not go deeper than *e*: it appears to be rather local. The gravel *g* was reached only in the trench opened in pit fig. 1. On the opposite side of the road to pit fig. 2, a well was dug through 25 feet of gravel and sand, but no exact particulars of it were kept. A few yards beyond this the gravel passes under the great mass of silt and peat filling the valley of the Somme. In the other direction (*i. e.* up the hill) the chalk comes to the surface at the distance of a few yards beyond and above the pits; but whether it forms a cliff against which the pleistocene beds abut, or whether it passes by a rapid slope under them, there is no evidence to show.

I have given a general theoretical section of the Menchecourt deposit across M. DUFOUR's pit*, showing its relation to the valley and to the later deposits, in Section 1, Plate X. (See also Appendix G.)

Organic Remains.—None have been found in the upper clay and rubble, *b*, *b'*; nor could I find or hear of any worked flints having ever been met with in them.

The loam *c* contains a few mammalian remains†. The only specimens, however, that I have collected, or at present know of, are the teeth of Horse and bones of ruminants and of Elephant, all much decomposed. Some flint-implements are recorded from this bed. I found in it shells belonging to the few following land species:—

Clausilia nigricans, Mat. ?

Helix hispida, Linn.

Helix arbustorum, Linn. ?

Pupa muscorum, Linn.

Of these the *Helix* and *Pupa* are common, and the *Clausilia* very rare. For a list of the extraneous microscopic fossils of this and the other beds, see Appendix (E).

It is, however, to the sands and gravels *d* and *e*, which may be considered as one bed, that the greatest interest attaches, on account of the flint-implements which are found in them, and of the abundance of mammalian remains, with land, freshwater, and marine shells. The bones mostly occur in or on the seam of flint-gravel, *e*: they are often entire, but the bulk are in fragments. The land and freshwater shells are most abundant in the sand *d*; while the marine shells are more common in the gravel *e*, although a few are scattered through *d*. The following list of organic remains is taken from the

* See also the section and description of this pit in *Antiq. Celt. et Antéd.* vol. i. p. 232–5.

† In the accounts hitherto published of the organic remains from Menchecourt, no mention is made of those from this bed, or rather no distinction is made between those which come out of this bed and those from the strata beneath it. It is possible that some of the mammalia enumerated from *d* and *e* may also have been found in *c*, or may even be peculiar to one or the other, although there is no doubt that the great majority of the specimens are from these lower beds.

works of M. RAVIN and M. BUTEUX, with the exception of a few additional species of Mollusca^a marked with an asterisk.

MAMMALIA.

<i>Bos primigenius</i> , Boj.	<i>Elephas primigenius</i> , Blum.	<i>Hyæna spelæa</i> , Cuv.
<i>Cervus Somonensis</i> , Cuv.	<i>Equus</i> (<i>E. fossilis</i> , Owen).	<i>Rhinoceros tichorhinus</i> , Cuv.
— <i>tarandus priscus</i> , Cuv.	<i>Felis</i> (<i>F. spelæa</i> , Owen).	<i>Ursus spelæus</i> , Blum.

TESTACEA.

Land.	Freshwater.	Marine.
<i>Cyclostoma elegans</i> , Drap.	<i>Cyclas palustris</i> , Drap. (<i>Pisidium amnicum</i> , Müll.)	<i>Cardium edule</i> , Lam.
<i>Helix arbustorum</i> , Drap.	— <i>cornea</i> , Linn.	* <i>Ostrea</i> (one fragment).
— <i>carthusiana</i> , Drap. (<i>H. cantiana</i> , Mont.)	* <i>Cyrena consobrina</i> , Caill.	<i>Tellina solidula</i> , Lam.
— <i>cristallina</i> , Drap. (<i>Zonites</i> , Müll.)	<i>Limnæa auricularia</i> , Mich.	<i>Buccinum undatum</i> , Lam.
— <i>hispida</i> , Drap.	— <i>minuta</i> , Lam. (<i>Limneus truncatulus</i> , Müll.)	* <i>Fusus</i> ? (one imperfect specimen).
— <i>nemoralis</i> , Drap.	— <i>ovata</i> , Drap. (<i>L. pereger</i> , Müll.)	* <i>Littorina littorea</i> , Linn.
— <i>pulchella</i> , Drap.	— <i>palustris</i> , Drap.	* <i>Nassa reticulata</i> , Linn.
— <i>rotundata</i> , Drap.	— <i>peregra</i> , Drap.	<i>Purpura lapillus</i> , Lam.
— <i>striata</i> , Drap. (<i>H. caperata</i> , Mont.)	— <i>stagnalis</i> , Lam.	
<i>Pupa marginata</i> , Drap. (<i>P. muscorum</i> , Linn.)	<i>Planorbis marginatus</i> , Drap.	
<i>Succinea amphibia</i> , Drap. (<i>S. putris</i> , Linn.)	— <i>carinatus</i> , Drap.	
* — <i>oblonga</i> , Drap.	* — <i>corneus</i> , Linn.	
* <i>Zua lubrica</i> , Müll.	* — <i>albus</i> , Müll.	
	* — <i>vortex</i> , Linn.	
	<i>Paludina impura</i> , Lam. (<i>Bithinia tentaculata</i> , Linn.)	
	<i>Valvata piscinalis</i> , Lam.	
	— <i>plandrbis</i> , Drap. (<i>V. cristata</i> , Müll.)	

I cannot say positively whether the single specimen of *Cyrena*, which is perfectly well characterized and marked by its striated teeth, came out of the gravel *e* or the sand *d*. I however picked it up myself, though it was thrown by the men out of the trench of which I was superintending the opening. A tooth of *Arvicola*, a small fish tooth, and opercula of *Bithinia*, were found under the same circumstances. Also an unperforated *Coscinopora globularis*, and a *Marginulina*, from the Chalk. On some of the flints in *e* are serpula-like markings.

The search for flint-implements was not so successful as I could have wished. As the

^a In this list of Mollusca I have retained the original names of M. CASIMIR PICARD (RAVIN, *op. cit.* p. 199). In the other lists I have given the names adopted by FORBES and HANLEY; here I have only introduced the latter as synonyms. In the Mammalia I follow generally the last lists of M. BUTEUX.

men were digging the gravel (*e*, fig. 2) I saw them find, enveloped in the sandy matrix (a portion of which was agglutinated on the specimens), three thin sharp-edged flint-flakes, 3 to 6 inches long. They were pronounced by M. DE PERTHES to be flint-knives, and they certainly differ from ordinary flint splinters or flakes, in that, in each case, the obtuse angle is truncated, as though to flatten the fragment and remove an unnecessary edge*. Although I cannot accept such specimens as sufficient proof, and it would have been satisfactory to have found some of the so-called flint hatchets *in situ*, I feel there is, without that direct evidence, enough moral and collateral testimony to form an opinion on the subject of M. DE PERTHES' views, supported especially as the case is by the occurrence of flint-implements elsewhere in the neighbourhood of Abbeville, and by the subsequent more easily verified discoveries at Amiens.

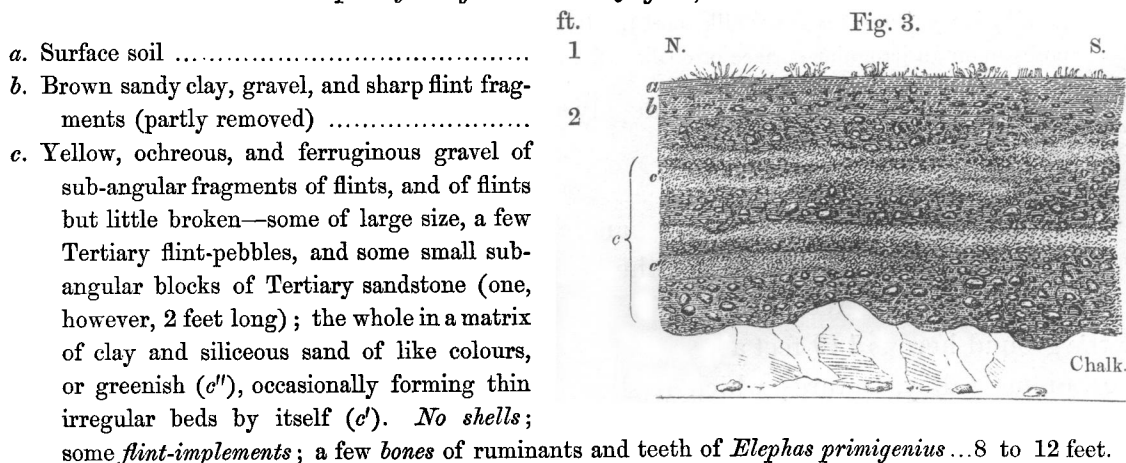
According to M. BOUCHER DE PERTHES, confirmed by the statements of the men, the flint-implements (*Haches*) are most commonly in the lower part of the sand *d* and in the gravel *e*.

In the underlying marl, *f*, I found the few following shells, together with traces of plants (*Chara* stems?) and one very minute bone, but no flint-implements.

<i>Cyclas</i> ?	<i>Limneus pereger</i> , Müll.	<i>Trochus</i> ? (very young).
<i>Helix hispida</i> , Linn.	<i>Planorbis albus</i> , Müll.	<i>Valvata piscinalis</i> , Lam.
—— <i>nemoralis</i> , Drap.	<i>Pupa</i> .	<i>Zua</i> ?
—— <i>pulchella</i> , Müll.	<i>Rissoa</i> ?	

Returning back through Abbeville, and ascending the gently sloping ground on the east of the town, Moulin Quignon is shortly reached, where, at a height of 106 feet above the mean level of the sea at St. Valery, is a bed of gravel showing this section.

Gravel pit adjoining the Moulin Quignon, near Abbeville.



* A further examination of these specimens shows them to be so closely similar to such implements found in barrows and in peat beds, in association with admitted human works, that I am now disposed to believe in their artificial make (see fig. 7, Plate XIV.). The flint-workers of Suffolk produce this form of flint-flakes by a single sharp blow applied in a particular way to a lump of flint. A flake is thereby knocked off, which at the end which receives the blow shows a conchoidal protuberance at one side of the flat inner surface; while the outer side presents two slightly inclined planes, with their obtuse angle replaced by a small facet. This is precisely the case in these fossil flakes. Such flakes always present, as mentioned by the learned author of the Descriptive Catalogue (p. 7), with reference to the flint-knives, cutters, or scrapers in the

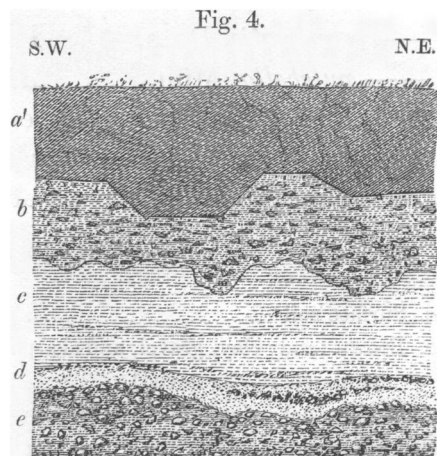
There is a pit of similar gravel at St. Gilles, on ground 17 feet lower and distant about half a mile to the southward. At neither of these pits did we ourselves find any flint-implements, nor had the men any; but here again they affirmed they often found them, chiefly in the lower and middle part of the undisturbed gravel, together with large bones.

Between the Moulin Quignon and the walls of Abbeville, there were formerly some gravel pits, in which a large number of worked flints were discovered; but the pits are now levelled, and the ground occupied as a "Champ de Mars." The town itself in part stands upon a bed of drift gravel and sand. In some excavations (now closed) between the Hospital and the ramparts, M. BOUCHER DE PERTHES also found remains of the Mammoth together with several flint-implements* (*ante*, p. 279).

I examined one deep excavation (fig. 4) now in progress on the N.W. side of the town. It exhibits thick beds of gravel spread out horizontally, with some interstratified seams of loam and sand, in which latter I found a few fragments of land and freshwater shells. The level of the ground here is rather lower than at the adjacent Menchecourt pits (see Sect. 2, Plate X.).

Section in the moat outside the town walls at the Porte Mercadé, 1859.

	ft.	in.
a'. Made ground	6	0
b. Angular flint-gravel in brown and ochreous sandy clay (corresponds with <i>b</i> of figs. 1 and 2)	5	0
c. Loam (loess), with thin seams of grit and gravel	6	6
d. Light-coloured sand and patches of gravel; fragments of shells (<i>Limneus</i> and <i>Helix</i>)	1	8
e. Sub-angular ochreous and white flint-gravel. Teeth of <i>Elephas primigenius</i> (one milk tooth). Reposes upon an irregular surface of chalk...	2 to 4	0



Several flint-implements, generally deeply stained, have been found here†.

Amiens.—On the verge of the hills, and at a distance of three-fourths of a mile S.E. from the railway station, are situated the very interesting and extensive pits of St. Acheul (Plan B, Plate X.). According to the measurements of M. PINSARD, the mean height of the ground here is 149 feet above the mean tide level at St. Valery, and 89 feet above the Somme valley, towards which it slightly inclines, till as it approaches the valley the ground falls by a more rapid and sudden slope, while southward it stretches with a gently undulating and gradually rising surface for many miles. The site of the pits is

collection of the Royal Irish Academy, "more or less of an obtusely triangular figure in its section." In all respect the specimens he describes and those I have seen in the British Museum, agree with the Abbeville specimens. M. DE PERTHES has a number of similar specimens from the pits at Menchecourt (fig. 3, Plate XII.), Moulin Quignon, and Mautort, and Dr. RIGOLLOT figures one from St. Acheul.—September 1860.

* See *Antiq. Celt. et Antéd.* vol. i. p. 247 to 264, for particulars and careful sections of these excavations.

† When last there, a broken specimen, now in my possession, was discovered in the lower part of *c*, within a few inches of the gravel *e*, the sand *d* being, at that spot, almost wanting.—July 1860.

not, however, commanded by any immediate high ground, but, on the contrary, possesses an open and unobstructed view for some distance around, and is then separated, by a slight depression, from the higher hills to the southward. The pits are of considerable extent, and have been long worked for brick-earth, sand, and gravel. The total thickness of all the beds, which repose upon a very irregular and eroded surface of chalk, varies from about 20 to 30 feet. The worked flints are found chiefly in the lower bed of gravel, more particularly in the lower part of it or near the chalk, where also the greater number of bones are found, but this is by no means a general rule. A considerable number of teeth and bones are also met with in the sand and marl above the gravel.

The upper brick-earth (b^1 and b^2) has been very generally removed, so that it is only in a few places that the entire series of beds is seen, as for example, by the well in T. FREVILLE'S pit (fig. 5), near the Cagny road, at which spot they are not only more complete but more regular than usual. Further on in the same pit (fig. 6) the brick-earth has been removed, and the lower beds are more irregular. At WAREAN'S pit, at the further extremity of the field, is another section complete from the surface to the chalk (fig. 7). These three sections show the variations in the structure of the lower beds (c and d). In conjunction with figs. 10 and 11 (p. 299), they likewise well exhibit the variations in the beds, b^* .

Sections in the pits at St. Acheul: side nearest the Cagny road.

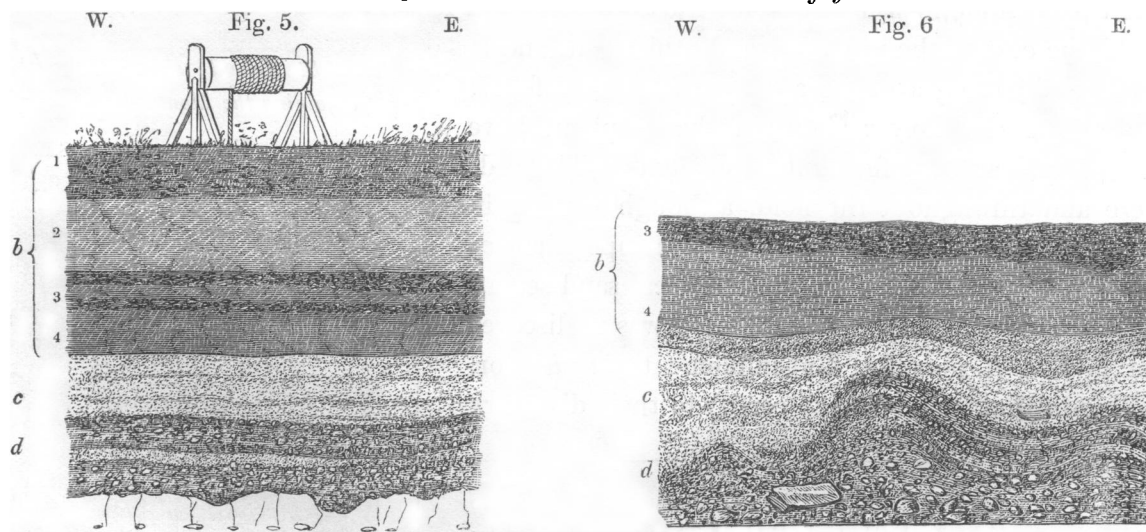


	Fig. 5. ft. in.	Fig. 6. ft. in.
a. Surface soil	0 8	
b. 1. Brown loam, slightly calcareous, with a few sharp flint fragments	2 10	
2. Ditto lighter coloured, finer, and more calcareous	5 0	
3. Ditto darker; not calcareous, and mixed with more or fewer angular fragments of flints, passing in places into a complete gravel	2 0	1 6
4. Ditto coarser and darker; in places calcareous; traces of carbonaceous matter	2 4	4 2

No organic remains have been found in the above beds.

* See also the sections and ground plan of the pit by Dr. RIGOLLOT, *op. cit.* pp. 33-36, pl. 3-5.

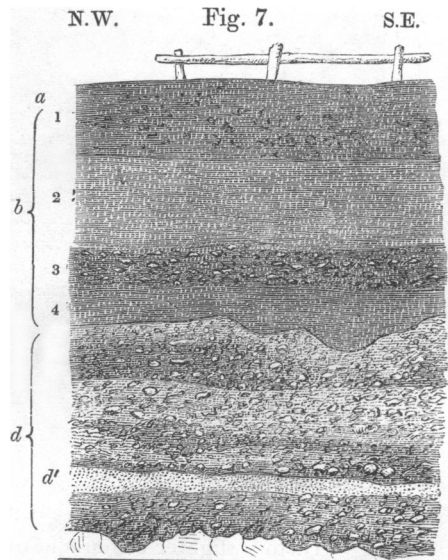
Fig. 5. Fig. 6
ft. in. ft. in.

- c. White siliceous sand and light-coloured marl, mixed with fine chalk grit; a few large sub-angular flints, and an occasional sandstone block; irregular patches of flint-gravel; bedding waved and contorted; here and there layers with diagonal seams; a few ochreous bands; portions concreted. *Land and freshwater shells* common; some *mammalian remains*; (*flint-implements*?) 4 10 7 4
- d. Coarse sub-angular flint-gravel in a base of white siliceous sand with chalk grit; occasionally coloured ochreous and ferruginous in irregular layers; a few black layers. Some large and whole flints, and some fragments angular, especially many small ones. Much fine chalk débris, pebbles, and small blocks rolled but not rounded. Numerous sub-angular pieces and blocks, small and large, of Tertiary (lower Eocene) sandstone; Tertiary flint-pebbles abundant; occasional specimens of Tertiary pudding-stone, and a few chalk (*Inoceramus*, *Pecten*, *Belemnites*, *Echini*, *Foraminifera*, &c.) and Tertiary fossils (*Venericardia planicosta*, *Nummulites* and other *Foraminifera*), are dispersed through this gravel. Subordinate seams of sand. Bedding in places level and in other places contorted, especially the upper surface. *Mammalian remains* and *flint-implements* dispersed throughout, but chiefly in the lower part. *Shells*, mostly in fragments (*Helix*, *Limneus*, *Psidium*, *Pupa*), in some of the seams of interstratified sand* 5 0 6 0
22 8 19

The blocks of sandstone are very numerous and large, especially in the pits nearest the high road, some measuring as much as 3 to 4 feet in length, and weighing $\frac{1}{2}$ to 1 ton†.

In the east of the field the sand *c* thins out, and is replaced by the gravel *d*‡, as shown in section fig. 7, where a good many remains of the Elephant have been found, and but few flint-implements. The beds here and throughout the field, although varying in thickness, have the same general composition as described in figs. 5 and 6. (*d'* is a local sand seam.)

One chief object in visiting the pits was to discover for myself, if possible, flint-implements *in situ*, or, failing in that, to be able to certify to their discovery

Section at St. Acheul: side of the field
adjoining the Monastery.

* In this gravel there are also found some small round white bodies, many with a hole through them. They were noticed by Dr. RIGOLLOT (*op. cit.* p. 16), who suggested that they might be beads made of hard chalk. They are not rare. I doubt, however, their being in any way artificial, for their globular form is natural, they being a common chalk fossil, the *Coscinopora globularis*, D'Orb. This is a small globular sponge or foraminifer,

of which the top is often more or less open or perforated. They are abundant on many parts of our chalk coast, especially at Newhaven, where I have found them on the shore, some whole and some perforated, precisely like those in the gravel of St. Acheul (now the *Orbitolina concava* of PARKER and JONES, 1860).

† There was one found which, judging from the number of door-steps (about 18) and paving stones (about 100) it furnished, must have weighed 4 or 5 tons.

‡ In one pit, nearly in the centre of the field, the sand was 16 feet thick, and the gravel almost wanting.

by the workmen. The long fresh faces of gravel afford, together with the digging for gravel in daily operation, ready and convenient sections for observation. On my first visit, notwithstanding a careful personal search, I found neither bones nor worked flints. I, however, obtained a number of the latter from the men, some of which were dug out whilst I was there; and in the overlying sand I found numerous land and freshwater shells, consisting of the following species:—

<i>Cyclas cornea</i> , Linn.	<i>Limneus palustris</i> , Linn.	<i>Pupa muscorum</i> , Linn.
<i>Pisidium amnicum</i> , Müll.	— <i>pereger</i> , Müll.	<i>Succinea putris</i> , Linn.
<i>Ancylus fluviatilis</i> , Müll. ?	— <i>truncatulus</i> , Müll.	„ (var. <i>Pfeifferi</i>).
<i>Bithinia tentaculata</i> , Linn.	<i>Planorbis albus</i> , Müll.	<i>Valvata piscinalis</i> , Lam.
<i>Helix nemoralis</i> , Drap.	— <i>marginatus</i> , Drap.	<i>Zonites radiatulus</i> , Ald. ?
— <i>hispida</i> , Linn.	— <i>spirorbis</i> , Linn.	
— <i>rotundata</i> (Buteux).	— <i>vortex</i> , Linn.	

Remains of the following species of Mammalia have also been found at these pits:—

<i>Bos</i> (<i>primigenius</i> ?)	<i>Elephas antiquus</i> , Falc*.	<i>Equus fossilis</i> , Owen.
<i>Cervus</i> .	— <i>primigenius</i> , Blum.	

Entire bones are comparatively rare in these pits, but fragments, more or less worn, are tolerably common. A portion, however, 4 feet long, of the tusk of an Elephant was recently met with; but it is more common to find it in small pieces, easily recognized by their ivory structure. Teeth of the Horse in a perfect and unimpaired condition are also far from rare, whilst entire teeth of the *Elephas primigenius* are not unfrequently found. The greater number of the bones are soft, light, and friable, and without any addition to their own earthy constituents; and having lost their animal matter, they mostly adhere strongly to the tongue. Some, however, have received an additional portion of carbonate of lime, whereby their weight is considerably increased. The enamel of the teeth is generally but little changed. Some of the fossils are more or less bleached; others are coloured by the peroxide of iron present in some layers of the gravel.

I had, however, hardly reached Abbeville when I received a telegraphic message from M. PINSARD, to inform me that a worked flint had been discovered *in situ*, and left for my inspection. I immediately returned, accompanied this time by Mr. EVANS†. As this was, I believe, the first flint-implement examined *in situ* at these pits by any geologists, I feel it necessary to describe it at some length. It was lying flat in the gravel, at a depth of 17 feet from the original surface‡, and 6½ feet from the chalk. One side slightly projected. The gravel around was undisturbed, and presented its usual perpendicular face. I carefully examined the specimen, and saw no reason to doubt

* DR. FALCONER has just informed me of his determination of this species, and of some other interesting facts connected with the fossil bones at Amiens. I have, with his permission, given an extract of his letter in the Appendix (B).—November 1860.

† M. PINSARD was also present, together with MM. DUFOUR and GARNIER, the President and Secretary of the “Société des Antiquaires de Picardie.”

‡ Six feet of the brick-earth at top had been removed. The bottom of the pit was 2 feet above the chalk.

that it was in its natural position, for the gravel is generally so loose, that a blow with a pick disturbs and brings it down for some way around; and the matrix is too little adhesive to admit of its being built up again as before with the same materials. At this spot the matrix of the gravel consisted of the usual chalky sand; the seam was continuous, the fragments of flint were in their ordinary position, and the cohesion of them and of the worked flint in the face of the gravel was exactly of the same strength. I found also afterwards, on taking out the flint, that it was the thinnest side which projected, the other side being less finished and much thicker,—a position therefore the reverse of that which would have been adopted had it been pushed in; if it had been, the hole made by the ingress of the thicker edge would have left the projecting thinner edge unsecured, whereas the matrix was close up to it all around, and neither harder, looser, nor differing in texture or colour from the adjacent portion of the gravel. When also I removed this implement *, I found that the sand, in all its minute indentations, corresponded exactly with the matrix of that particular seam of the gravel. I carefully examined the ground above, and could detect no trace of any artificial disturbance. Each bed followed its natural course above the place where the flint-implement was imbedded, and the lines of division of the upper brown gravel and clay, of the light-coloured sands, and of the lower gravel, were continuous and unbroken. The section at this spot was as under—

	feet.
b. { Brick-earth (removed).....	6
{ Brown sandy clay and gravel	1½
{ Brown sandy clay, reposing upon an irregular surface of c	2½
c. While chalky sand with freshwater shells, thinning out at one end of the section	3
d. Coarse gravel, in which, at a depth of 4 feet, the <i>flint-implement</i> was imbedded	8½

In another and deeper part of the pit, the workmen on the same day turned out, amongst the dug gravel, two more perfect specimens of flint-implements, from depths respectively of 20 and 24 feet beneath the original surface. Portions of the white calcareous matrix still adhered to these implements, and they were partly stained ochreous, like one portion of the gravel with which they were in contact. This part of the pit was, like the other, perfectly undisturbed. The bed of sand over the gravel was, however, more developed and more argillaceous, and I found in it, immediately above the place where the flints were lying, many perfect specimens of the fragile *Limneus*, *Succinea*, *Planorbis*, and *Helix*. The workmen brought us some ten or twelve more flint-implements recently discovered. They all affirmed these flints† to be found low down in the gravel and in unbroken ground (*terrain vierge*). When the pits are in full work, a day rarely passes without some of these objects being met with. The number is in fact one

* This implement is rougher and more imperfect than the generality of the specimens; still it exhibits evident traces of working, especially on one side and at the point. It is an unfinished implement, resembling in that respect several I have since seen.

† Now commonly known to them by the name of “Haches.” The children sometimes call them “Langues de Chat.” I may observe that our visit, both at Abbeville and Amiens, was entirely unforeseen and unexpected, and very little value was then placed on either flint-implements or fossils.

of the surprising features of the case. Dr. RIGOLLOT mentions that between August and December 1854, above 400 of such specimens were found at St. Acheul, and that, from the time he began collecting, 150 had been brought to him*. They are not found together or in heaps, but separately and at greater or less intervals. The bulk of them show very little appearance of wear. Many are as sharp and fresh-looking as though they had but recently come from the hands of the workman. I have, however, some which are distinctly worn; and a few specimens which had been broken before they were entombed, as shown by the colour and staining of the fractured surface, in particular exhibit a blunting of the broken edges. Some are unfinished, and some retain portions of the outer original chalky crust, wherever it suited the form of the implement. They are said by Dr. RIGOLLOT never to be found either in the upper brown clay or gravel, *b* †.

We afterwards visited several neighbouring gravel pits, with a view to determine the relation which the beds at St. Acheul bore to the other drift beds of the district. At St. Roch, on the south-west of Amiens, and $1\frac{1}{4}$ mile distant from St. Acheul, is a large gravel pit, celebrated for the number of its mammalian remains‡. It is situated on the lower part of the hill, sloping down to the valley. The gravel consists, like that at St. Acheul,—except that it has fewer ferruginous or ochreous seams and sandstone blocks, and more chalk *débris*,—of a mass of loosely packed white and light-coloured sub-angular flints, tertiary flint-pebbles and sandstones, sand, and chalk rubble, from 20 to 28 feet deep, overlaid by 3 to 8 feet of brick-earth. The following is the list of mammalian remains from this locality:—

<i>Bos primigenius</i> , Boj.	<i>Elephas primigenius</i> , Blum.	<i>Hippopotamus</i> §.
<i>Cervus somonensis</i> , Cuv.	<i>Equus</i> (<i>E. fossilis</i> , Owen).	<i>Rhinoceros tichorhinus</i> , Cuv.
<i>Elephas antiquus</i> , Falc.		

We found no shells in any part of this pit. Dr. RIGOLLOT states that some few flint-implements have been met with; but we discovered none, nor could we hear of any having been recently found. The level of the ground is lower than that at St. Acheul, extending from about 45 to 60 feet above the Somme; and the gravel does not range up the hill, but abuts against it, and is commanded by the chalk hills, as the sand at

* *Op. cit.* p. 15. On my first visit we brought away from the pits about 26 specimens; on a second visit 38; on a third visit 32; and on a fourth visit 14. It must not, however, be supposed that they are easily found. They require a long and careful search.

† I have since had reason to question this point, but the evidence is contradictory.

‡ There is a collection of the fossil bones from this pit in the Museum at the Botanic Garden. They are mostly more blanched and decomposed than those at St. Acheul, and are generally very friable, though many of the specimens are perfect in shape and well preserved. Teeth of the *Elephas primigenius* and of the *Rhinoceros tichorhinus* are common. See BUTEUX, *op. cit.* p. 71, and RIGOLLOT, *op. cit.* p. 35.

§ On my second visit to this pit we obtained from one of the workmen four fine and well-preserved tusk teeth of the *Hippopotamus*,—a genus not previously noted from this place. The *Elephas antiquus* has also just been noted by Dr. FALCONER.—November 1860.

Menhecourt. In proceeding to St. Acheul, at a short distance eastward, and nearly on the same level, is a bed of 15 to 20 feet of clay and sand. A little way higher up the hill the chalk comes to the surface, or is merely covered by 2 or 3 feet of brick-earth. The beds at St. Roch and St. Acheul, whatever may have been the case originally, are not now continuous. Still they trend one towards the other round the base of the hill, having been traced along part of the railway cutting.

NOTE.—I again visited Abbeville and Amiens in June 1859 with some other Members of the Geological Society. On this occasion my friend Mr. J. W. FLOWER succeeded, after some search, in disinterring *with his own hands* a fine and large flint-implement at a depth of 22 feet from the original surface of the ground,—an important and conclusive fact to which we all bore witness. An account of this discovery has been communicated to the Geological Society. (Quart. Journ. vol. xvi. p. 190.)

Shortly afterwards Sir CHARLES LYELL visited the pits, and expressed an opinion confirmative of the antiquity of the flints at the Meeting of the British Association at Aberdeen (see Report of the Proceedings). He was followed by M. GAUDRY of Paris, who spent several days at Amiens for the purpose of exploring the pits, and witnessed the finding of nine flint-implements. The result of his observations he communicated to the Institute of France in October 1859 (see the Comptes Rendus of the 3rd Oct.). M. GEORGE POUCHET, of Rouen, deputed by the municipality of Rouen to visit the pits, published a report, in which he described his having seen and extracted a worked flint *in situ*, and fully confirming M. BOUCHER DE PERTHES' discovery (Actes du Mus. d'Hist. Nat. de Rouen, 1860, p. 33). M. DESNOYERS and M. HÉBERT have also made a further examination of this singular locality, respecting which M. HÉBERT has given some additional explanation to the Geological Society of France (Bull. vol. xvii. p. 103).—April 1860.

§ 3. NATURE AND VALUE OF THE EVIDENCE.

Questions have been raised,—1st, as to whether the so-called flint-implements have really been fashioned by the hand of man; 2ndly, whether they can be of recent manufacture; 3rdly, whether they could have got into their present position subsequently to the formation of the beds in which they are found, or whether they truly belong to the same period.

1 Under ordinary circumstances I should hardly have deemed it necessary to touch, in a geological paper, upon some of the following points, if satisfied myself with the evidence usually deemed conclusive in like cases. In a question, however, of this importance, a few remarks, which to many will, I fear, appear supererogatory, seem required to meet the various objections that have been raised.

It is essential, as a preliminary step, to recollect that the argument does not rest upon the evidence of skill, but upon the evidence of design. The skill being rude (for the flints are only chipped into form and in no degree ground down) is not always evident at first sight, and hence the existence of design has been sometimes denied. Flints from the chalk hills of the district itself readily supplied the material of which the flint-implements are formed. The exterior of all chalk flints invariably presents a white earthy crust, from which small fossils frequently project, while the interior of the flint is black or dusky, but clear and semi-transparent. The fracture is conchoidal or splintery; and there is no tendency to break in one direction rather than in

another*. It may happen that a shattered flint (by whatever natural cause produced) should give flakes or splinters closely resembling simple forms produced by one or two blows applied artificially. But here the coincidence must cease; for it is obvious that blows applied by hazard and resulting from natural causes, as in a *mêlée* of gravel, would necessarily multiply their direction of strike in proportion as the blows themselves were multiplied, and consequently the shape of the flint would tend, up to a certain point, to become more and more irregular; whereas, on the contrary, blows applied by design, and with a given object in view, would tend to give to the flint more and more finish, form, and evident art. So with respect to the flints in the gravel the more broken the more irregular, whereas, on the contrary, with the flint-implements the more they are chipped and broken the clearer is the design. In many lance-head shaped specimens both sides show two plane surfaces meeting at an obtuse angle, each plane formed by ten to twelve parallel chips, and in these and all cases every blow or chip has distinct reference to the ulterior form (see figs. 5 and 8, Plates XIII. & XIV.).

With regard to the possibility of the flint-implements resulting from natural wear, I have already mentioned that in many of the specimens the outer coat of the flint is frequently adapted and left, when possible or convenient, in the finished instrument (see fig. 4, Plate XIII.), and such original surfaces show so little trace of wear that small delicate fossils, so often found projecting on them, still remain untouched. If the flint had been so extensively fashioned by wear, how could one portion, and always a prominent part, have remained unworn, while other portions have been so largely abraded†? Besides, the tendency of wear, if sufficiently long continued, is ultimately to reduce the flints to the rounded form of pebbles, a condition of things incompatible with the retention of the sharp points and cutting edges of these implements.

But it is not so much upon the improbability of the chances of natural causes producing such forms, as upon the unity of character and evident object in the design, that the argument of artificial make is the strongest. Even if some natural cause did tend to produce deceptive forms, it would be, as before mentioned, according to some one given simple type, such as the flint knives or single flakes; but in these implements we find three principal types‡,—one, lance-shaped (fig. 8); a second, almond-shaped (fig. 5); and a third smaller form, a flattened ovoid (fig. 1), (Plate XII. to XIV.). In length they vary from 2 to 11 inches, a medium size being the most general. These forms are constant, and each type presents a nearly constant relation between the length and breadth of the specimens. In A there is a sharp point, with a central, and often high, midrib on either side; in B we find a rounded cutting end, the sides flatter, and the midrib is less marked. In both forms one end is generally large and blunt, and the side-edges sharp; and advantage is taken, at the blunt end, of the original outer surface and form

* Or as the gun-flint makers observe, "flint has no grain." It has not in fact the slightest cleavage.

† Where they have undergone wear in the gravel, they, like the ordinary flints, have their edges blunted and are irregularly broken, and they are not unfrequently truncated at the point.

‡ Besides some minor ones, as flint-flakes, and the leaf-shaped implements of Mautort (figs. 2, 3, Plate XII.).

of the flint. In C the whole flint is worked; the cutting edge extends all round, and the midrib is not so distinct, or is rounded off. Now, it is to be observed that these cutting edges are always on one plane, and that they were produced by blows applied at the edge—the occasional splintering caused by the blow being generally apparent;—and that the sides are equilateral. This regularity of structure surely implies design, the application of forethought, and an intelligent purpose. One object is apparent throughout, that of giving to a hard durable substance a shape either sharp-pointed or cutting. Nothing surely but the human hand could have directed a series of blows not only parallel one with the other on each surface, but also carefully directed along and maintained on one given plane, and resulting in producing a symmetrical form. Under natural conditions of fracture, the greater number of blows would, on ordinary chances, fall on the broadest surfaces of these flints, and no sharp point and angle could be permanently maintained, still less gradually elaborated.

In considering this point I have confined myself to the one set of implements termed “Haches” by M. BOUCHER DE PERTHES*. On many of the other forms noticed by that gentleman there might reasonably be more difference of opinion. It suffices for our purpose, in treating of the geological question, that we have one set of implements showing art and design.

Lastly, all these flint-implements exhibit a peculiar and distinct type and a general agreement in finish and shape. They are not copied from any other form, nor do any others exactly resemble them†.

2. On the second point various considerations present themselves. If, however, the question can be settled upon the single character of the effects of weathering on the specimens our end will be attained; at the same time other objections will incidentally be disposed of. Some chalk flints when broken retain their clear dark surfaces comparatively unaltered for ages; others, on the contrary, weather white in the course of a few years‡. When, however, the flints are imbedded in gravel, the alteration depends more upon the nature of the matrix. The broken flints there retain, in some parts, their black surfaces fresh and unchanged, but with a more marked vitreous lustre than in freshly broken flint; while in other parts of the same bed they are stained more or less deeply by the nature of the matrix in which they are imbedded. Thus in siliceous and chalky sand, flints will remain unaltered; in some marls and clays they become opaque, white, and bright as porcelain; in ochreous sand, especially if argillaceous, they stain yellow, whilst in ferruginous sands and clays they assume a brown colour. This staining is so

* *Op. cit.* vol. i. p. 347–77.

† The ordinary so-called stone celt is squarer and more chisel-shaped, and is generally more or less ground. The flint flakes or knives found at Menchecourt, and one figured by Dr. RIGOLLOT from St. Acheul, seem, however, identical with the more recent specimens. For fuller information connected with these various points, see Mr. EVANS's interesting letter in Appendix (A), and his paper before referred to.

‡ In the old part (11th century) of the Tower of London and in the old Norwich and other churches, the flints still show a dark surface but little altered by long exposure.

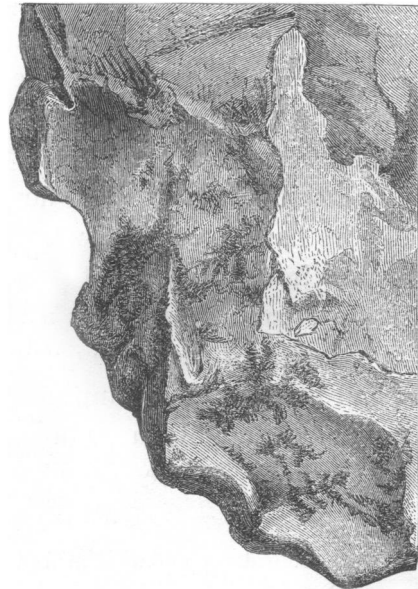
strong and permanent, that no subsequent exposure will remove it. In studying the drift deposits, I have found it a convenient test whereby to trace one set of flints from the gravel of one period to that of another, when the general appearance of the two gravels has been so much alike, that, but for the presence of these derived portions, it would be difficult to separate them. Now in looking over M. BOUCHER DE PERTHES' fine collection, you are at once struck with the fact, that the flint-implements from each locality present a colouring in perfect accordance with the lithological character of the bed of which they had formed part, indicating, I believe, not only a real derivation from such beds, but also a sojourn therein of equal duration to that of the naturally broken flints occurring in or forming part of the same beds. Some of those from the sand *d* of Menchecourt are not discoloured; others, however, exhibit a more or less white porcelanic coating. This depends probably upon the occasional presence in the sand *d* of white clayey and marly seams (*d'*). Those from the ochreous gravel of Moulin Quignon are, on the contrary, stained of a bright yellow or ferruginous colour. The same variations exist at St. Acheul; some of the flint-implements still retaining their fresh black surfaces, whilst others are weathered white or ochreous, according to the character of the particular seam of gravel in which they are met with, the unaltered ones being the most frequent, as the white gravel is in the largest proportion.

In the next place, these flint-implements, not being ground or polished, present a rough surface, often with many small hollows and angles in which the matrix can lodge; and in all the specimens from the different localities, which still retained portions of the

Fig. 8.



Fig. 9.



matrix, either in such cavities or adhering to the surface, the material was invariably in accordance with that of the bed from which they were reported to have come.

Further, many of the worked flints, especially those at St. Acheul, are coated, more

or less, on their chipped or made surfaces, by a film of deposited carbonate of lime (fig. 8); some also are marked with superficial dendritic impressions (fig. 9),—both features only to be produced by considerable time, and both common on the flints composing the mass of the gravel itself. The preceding figures represent portions ($\frac{1}{4}$), twice enlarged, of two specimens from St. Acheul on which these characters are exhibited*.

That we may often pass a considerable time in examining a section of drift gravel known to contain mammalian bones, and yet not succeed in discovering any, must have been experienced by all who have worked at beds of this age. In such cases the specimens are necessarily obtained from the workmen, whose opportunities are constant. I have been, time after time, to the well-known pits at Grays Thurrock, which have supplied so rich a series of mammalian remains to our museums, and never found a single specimen by my own search. At Ilford and Erith I have, on the contrary, readily procured an abundance of small specimens with my own hands. Again, the large gravel pit adjoining the Croydon Station, was extensively worked for several years before the fragment of a bone was found, and then the men found only a few rare pieces of the tooth and tusk of the Elephant. When, therefore, the remains are not abundant, the evidence of their really occurring in the position assigned to them must depend, in great measure, upon the honesty and veracity of the men, and on the concordance and condition of the fossils. I have rarely, on such occasions, had cause to doubt the former, nor, after a little experience, have I had much difficulty in deciding with regard to the latter. The workmen with whom I came into contact in France seemed to me as generally equally deserving of confidence. Their testimony was given freely, and was concurrent at each locality, and equally so in comparing the different localities between which there was little or no communication. Now all the workmen to whom I spoke, both at Abbeville and Amiens, were unanimous in assuring me that the flint-implements were found in the undisturbed gravel indiscriminately with the fossil bones. Not only did the workmen all agree on this point, but the foremen and proprietors of the pits bore testimony to the same fact,—a fact which to a certain extent I can now corroborate from my own experience†.

3. Finally, we have to consider whether it is possible for the flint-implements to have been introduced into their present position within some comparatively recent period, or whether they are contemporaneous with the accumulation of the gravel; and further, whether the remains of the large extinct mammals could have been derived from some older beds, and therefore be of anterior date to the flint-implements.

These implements might have got imbedded in the gravel,—1st, by artificial excavations; 2ndly, by rents in the ground. To anybody accustomed to the examination of

* Many of these considerations will be found alluded to by M. BOUCHER DE PERTHES, as well as by Dr. RIGOLLOT. Dr. L. DOUCHET of Amiens aptly observes that these incrustations “sont pour nous ce que la patine est pour la medaille.....la preuve ou le signe impossible à nier de leur antique origine” (*Antiq. Celt. et Antéd.* vol. ii. p. 431).

† That we have to regret attempts at, as well as successful instances of, deception, must be admitted; but that such are the exception to the general rule I am, from long experience, fully satisfied.

drift deposits, there is little difficulty in distinguishing between the fresh and uniform appearance of undisturbed beds, and the mixed and confused make of made ground, independently of the occurrence of any charred materials, pottery, &c., and of bones in a comparatively fresh condition. The lines of original stratification once broken cannot be so restored as not to show the break of continuity. In the St. Acheul pits, the several divisions of the gravelly clay, *b* (figs. 5, 6, 7, 10, 11), and the two of the underlying sands and gravel, *c*, *d*, each present distinct divisional lines and differences in colour. Now these lines and this bedding continue uninterruptedly over the portion of the lower gravel where the flint-implements are found. There is no break, no disturbance, and the small delicate fossils in the sand *c* remain uninjured, except at such places where the ground has been dug for brick-earth or otherwise excavated, and then the disturbance is sufficiently apparent. At St. Acheul part of the field was occupied for several centuries as a Gallo-Roman burying ground. But the old sepultures rarely extend deeper than the brick-earth and gravel, *b*. Some fine specimens of stone coffins (of the hard and sandy lower chalk) remain on the ground, the surrounding brick-earth having been excavated. Of the wooden coffins nothing but the ironwork remains. Roman coins, and fragments of old pottery are found on or near the surface, and the new ground is, in places, strewn with human bones. The following sections in F. FREVILLE'S pits, show how distinct the line is between the disturbed and undisturbed ground.

Sections in the pits near the high road at St. Acheul..

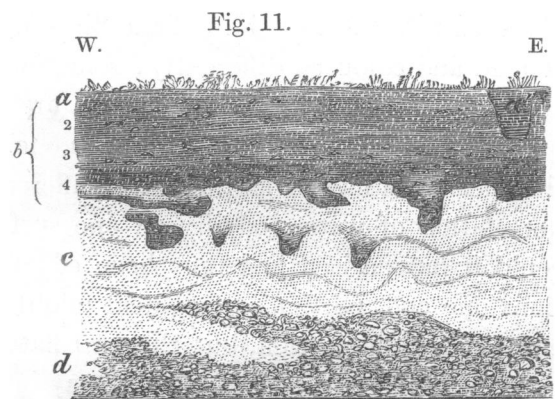
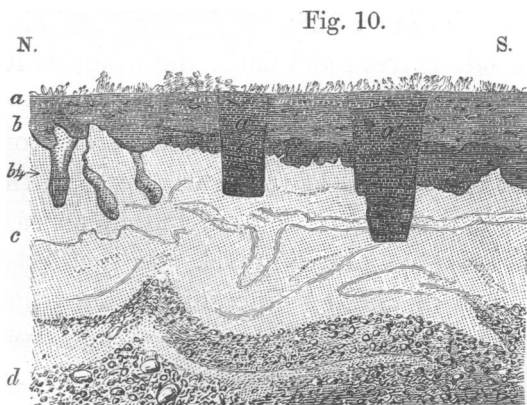


Fig. 10. Fig. 11.

	ft.	in.	ft.	in.
<i>a</i> . Surface soil;— <i>a'</i> . Made ground and graves ($7\frac{1}{2}$ feet and $9\frac{1}{2}$ feet) with human bones	0	6	0	6
<i>b</i> . Brown sandy clay and angular gravel; the lower bed (<i>b</i> 4) is almost wanting	6	0	6	6
<i>c</i> . Whitish sandy marl with yellow seams: few shells: contorted lamination.....	6	0	5	6
<i>d</i> . White gravel, irregular and contorted. For details of the composition of these beds, see description of figs. 5 and 6, pp. 289, 290. There are more bones and teeth, and fewer flint-implements, here than in the pits nearer the Cagny road.				

At Menchecourt I found the ground disturbed in one spot to a depth of 6 feet, but everywhere else it was undisturbed beyond a depth of 1 to 2 feet. In no case did I

find the white sand *d* (figs. 1, 2, p. 284), in which the flint-implements are chiefly found, in any way disturbed. The depths noted on some of the specimens in M. DE PERTHES' collection, such as 4, 5, 6, and 7 mètres, sufficiently remove them from the probability of ordinary superficial disturbing causes.

Rents may have arisen from desiccation of the surface or from earthquake movements. In the former case, such gaps would necessarily be filled up from the sides or from the surface, and a vertical seam of matter, differing more or less from the beds it cut through, would be traceable from the surface down to the flint-implements, but there is not the slightest appearance of such a state of things in these pits. The same objection would apply to openings produced by earthquake movements, though to a lesser extent, as such might have closed up again and not remained open until filled up. Still, with gaps in such loose materials, and on the assumption that the flint-implements themselves fell into such gaps, other stones, dirt, and parts of the walls must inevitably have also fallen down and shown traces of the presence of materials foreign to the several beds; this is not the case. Also the fine lamination common in the bed of sand (*c*) forms continuous and unbroken lines. Besides, as irreconcilable with any contingency which would have led to the introduction of the flint-implements from the ground above, the flint-implements are dispersed singly and irregularly, are limited to the one lower series, and lie apparently flat in the gravel, and not edgeways or downwards. The specimens extracted by myself was certainly, and the one found by Mr. FLOWER was apparently, in that position. In a certain proportion of the specimens from St. Acheul, I have also observed that the two sides of the flint-implements present a different appearance, being stained and coloured differently; sometimes one side is fresh and dark, the other white and with dendritic markings; others are white on one side and brown on the other; others again have a calcareous film on one side only. These appearances may arise from the specimens having lain between differently coloured seams of the gravel, or from the percolation of water lodging on one surface more than on the other; but in no case could it have arisen had they been edgeways or endways in the gravel. In such positions one end, portion, or segment might be stained or marked differently to the other end or another portion, but the two flat sides could not possibly have been immersed each in a different medium, in the way indicated by their present condition.

The remaining question, whether the fossil bones may have been derived from an older deposit, presents a contingency requiring especial notice. That such a case is possible, is evident from the circumstance of fossils and débris of various Tertiary strata being found in the gravel. Still there are, I think, valid objections to this supposition. 1. The fragments of bones, although constantly found with their sharp angles worn and blunted, never assume a rounded pebble-form, or exhibit an extent of wear materially differing from or exceeding that to which the flint-implements themselves have been subjected; while, as a general rule, the entire bones and the teeth are either not rolled at all, or are so slightly so, as rarely to be in any way injured by attrition. If the bones were really derived from an older bed, then consequently they would

in general be worn as much as any other materials derived from such a source,—a wear necessarily in excess of that of the newer portion of the gravel,—whereas, on the contrary, the bones are amongst the least worn substances in it*. 2. Neither do the bones or teeth show any mineral character, nor is there any substance adhering to them, different to that which would be imparted by the matrix in which they are now imbedded. Nor, if they had only been originally subjected to their actual extent of mineral change, would they have been in a better condition to resist destruction by subsequent exposure and wear than they are now. The teeth of the Elephant are mostly much decomposed, and tend, without great care, to fall to pieces on exposure. Many of the bones are also very friable, the greater number being porous and free from any foreign matter. 3. No older beds, that could have furnished such mammalian remains, are known to exist in the district†. 4. The delicate and friable shells, found associated with the bones at St. Acheul and Menchecourt, and that could not possibly have withstood any transfer, are such as are associated with similar remains elsewhere in France and in England, where we have no reason to doubt the contemporaneity of the two sets of organisms. 5. At St. Acheul part of the lower jaw with the teeth, and considerable lengths (4 and 5 feet) of the tusk, of *E. primigenius* have been found. At Menchecourt the bones of the leg, lying in their natural position, and nearly the whole skeleton of a *Rhinoceros*, were found entire‡,—the first being an improbable, and the second an impossible contingency, had the remains of the animal been washed out or removed from some older deposit. 6. Lastly, the extinct mammalia are of species which occur, both in England and France, only in the latest geological deposits, whereas if these remains were here extraneous, we should expect to find some species peculiar to deposits of anterior date.

An objection has also been taken on the score of the large number of flint-implements discovered at St. Acheul. But this is confounding two distinct propositions. To substantiate the discovery of a fact, it is not necessary to be prepared with an explanation of all the phenomena connected with it. In this light it, no doubt, presents a difficulty, which, however, it is to be hoped that future research will clear up§. I may mention in

* The wear which will hardly affect a flint-fragment will reduce a calcareous stone to a pebble-form. The local gravel of an oolitic district is usually composed of smooth flat pebbles, whilst if flint-fragments are present, as is common, they are angular or subangular. Extraneous fossils, as in the Crag, necessarily present, in general, the maximum of wear, besides showing more or less lithological dissimilarity.

† It is quite possible, at the same time, that here, as elsewhere, older gravel beds may have furnished some of the materials of this gravel. In fact I should judge such to be the case, from the circumstance of many of the flints found in the white chalky beds being of a brown colour and all the edges rounded, showing therefore a mineral condition incompatible with their present position, and a large amount of wear.

‡ On this essential point I give the evidence of a late distinguished naturalist of Abbeville. Appendix (C).

§ To show, however, how abundant flint-instruments must have been at periods when the use of metals was in its infancy or unknown—at Cantin, near Douay, there were found, in 1824, 600 ancient flint flakes or knives amassed together in one heap (Mém. Soc. d'Emul. d'Abbeville for 1836-37, p. 257); and the eminent antiquary, M. WORSAAE, of Copenhagen, in a letter written with reference to this subject, mentions that he and a friend "collected, in the course of a few weeks, more than a thousand rude flint-implements" on the borders and islands of the small lake of Maribo. (The Athenæum for 31 December, 1859, p. 889.)—November, 1860.

the meantime that, although these flints are so numerous in one pit at St. Acheul, they are scarcer in the other pits in the same field; that at Menchecourt they are rare, still rarer at St. Gilles, more common again at the Champ de Mars; whilst at the large gravel pits* of St. Roch, Boves, and Montiers near Amiens, where the St. Acheul discoveries were perfectly well known, and search has been frequently made, I could neither find, nor procure from the men, any flint-implements. See Appendix (D.)

§ 4. GEOLOGICAL CONSIDERATIONS.

I should not wish, until after fuller study of the district, to enter on the question regarding the mode of formation of the above-described deposits of Abbeville and Amiens, beyond pointing out, that, at the former place, the evidence of the lower beds of Menchecourt having been deposited partly in fresh water, and partly in salt or brackish water, seems sufficiently clear and distinct. Apart from the latter condition, the St. Acheul sands (*c*), as well as the lower gravel (*d*) containing the flint-implements, may also be attributed to a like accumulation under fresh water. The upper beds (*b*) in both cases are, I believe, of entirely different origin, and belong to a class of phenomena of far wider extent and generality. At the same time, while postponing the more theoretical questions, the one concerning the relative age of the deposits can, to a certain extent, be considered independently upon the evidence of the organic remains and of correlation; and certain general conclusions may be ventured upon.

It is probable that subsequently to that phase of the Glacial period marked by the Boulder Clay, the area of dry land became more extended, and on it there lived the *Elephas primigenius* and *E. antiquus*, *Rhinoceros tichorhinus*, *Hyæna spelæa*, with species of *Deer*, *Horse*, and other animals, mostly of extinct, but some of species not to be distinguished from the recent; whilst the waters of both sea and land were tenanted almost exclusively by shells of recent species still common in this and adjacent countries. The remains of this old surface we find in deposits, which everywhere contain a similar group of organic remains, and occur mostly in old valleys or at moderate elevations. They are never overlaid by other fossiliferous deposits, and I believe them all to belong to a state of things which immediately preceded the present order. One feature of these deposits is, that although closely related to the present configuration of the surface, yet they are always more or less independent of it. They are often near present lines of drainage, yet could not, as a whole, possibly have been formed under their operation. The deposits described in the preceding pages are, there is little doubt, of this age, and they have many analogues in France and England. The Menchecourt beds bear a very close resemblance (the marine characters apart) to those of Fisherton† near Salisbury‡. The deposit of St. Acheul is like, in many respects, the Ilford and the Brentford beds, whilst that of Moulin Quignon and St. Gilles closely resembles the gravel beds at Croydon, Wandsworth Common, and some other places near London.

* All on a lower level than St. Acheul, but with like mammalian remains,—showing like wear.

† Quart. Journ. Geol. Soc. vol. xi. p. 102.

‡ Also of Orton, near Peterborough, where marine remains do occur.

The gravels of Moulin Quignon and St. Acheul are placed respectively 88 and 89 feet above the valley of the Somme, are not commanded by any higher ground immediately adjacent, and are out of reach of all running water, or of any possible interference from agents in present action. At Menchecourt and St. Roch, on the contrary, the beds are placed against the side of the chalk hills, and slope from a height of about 60 feet down to the valley. Still these lower-level deposits are, although not to the same degree, quite beyond the agency of present river action, and are independent of recent changes.

It is probable that the various beds, although on these different levels, belong to the same general period, and may be nearly synchronous. Had I, however, been asked to decide upon physical evidence alone, I might have been disposed to consider the gravels on the low hills of Moulin Quignon and St. Acheul as a stage anterior to those of Menchecourt and St. Roch; but although I throw out the suggestion for the purpose of directing attention to the point, as one not to be overlooked, it is one which could not be decided without further evidence, and which I should hesitate at present to adopt. It is sufficient, for the object we have under immediate consideration, to substantiate the views expressed by M. BOUCHER DE PERTHES relative to the existence of the works of man associated with the remains of extinct animals in ground which has never been artificially disturbed, and belonging to strata of the Pleistocene period, irrespective of slight differences of age amongst the beds themselves, if any such really exist.

It may be instructive to inquire on what grounds this discovery and other analogous cases have been so long considered inadmissible as scientific facts. I have already noticed some criticisms called forth by M. BOUCHER DE PERTHES' work. One great cause of its neglect must have arisen, I conceive, from the injustice which the plates do to the objects described. The sketches of the implements are mere outlines of greatly reduced size, so that it is really often difficult to detect any definite shape or form even in those which belong to his group of hatchets. This, without a knowledge of the objects and of the localities, must have led, both in France and this country, to their being considered by many as merely chance forms of flints. It was probably this circumstance which caused Dr. MANTELL*, from his not having seen the original specimens, to rank these discoveries as amongst the many cases of mistaken observation and determination. While admitting the value of his antiquarian labours, Dr. MANTELL considered that M. DE PERTHES had not made himself sufficiently acquainted with geological phenomena, and observed "that the so-called works of art, figured and described by M. BOUCHER DE PERTHES, are nothing more than accidental forms of pebbles and stones, similar to those that occur in strata of immense antiquity, and which never can have been fashioned by the hand of man."

In the case of the occurrence of flint-implements in Kent's Hole, as discovered by the Rev. Mr. M^cENERY, attested by Mr. GODWIN-AUSTEN, and by Mr. VIVIAN† and the Torquay Natural History Society, I do not see the grounds on which the evidence was

* *Opus cit.* p. 4.

† *Quart. Journ. Geol. Soc.* vol. iii. p. 353.

objected to, except that the fact was considered impossible and the chances of error great. It was not, I believe, controverted upon any specific grounds.

With regard to the remarkable case of the Liége caverns, Dr. SCHMERLING being a proficient comparative anatomist, his opinion necessarily attracted considerable attention, and a report on his work was presented to the "Académie des Sciences" by M. GEOFFROY ST.-HILAIRE*. Dr. SCHMERLING considered that the one sufficiently perfect skull found with the bones of the extinct animals was of a low order, and suggested that it resembled rather the skull of an Ethiopian than that of an European: he further expressed an opinion, that the human bones, together with the flint- and bone-implements discovered in these caves, belonged to a race of antediluvian men†. M. GEOFFROY ST.-HILAIRE, than whom there could not have been a better judge, looking apparently at the question from this point of view only, came, no doubt justly, to the conclusion that these presumed fossil skulls presented no greater deviation from the present type than might be found in many varieties of the Caucasian race now living. Whence it being inferred that the two skulls were those of existing man, and therefore, though ancient, not of Pleistocene date, Dr. SCHMERLING'S opinion failed to obtain acceptance. But it seems to me that it was judging the question on what in law term is called "a false issue;" for the main question was not whether we here had an extinct species of man, but whether these skulls, being those of man, were actually in true association with the remains of extinct animals. It does not follow, nor did M. SCHMERLING insist, that because the animals were extinct, any race of man occurring with them must also be of an extinct species.

I notice these few cases to show that it may in some instances be necessary to revise the opinions which have been passed on these and many other more or less probable cases, and that we may have to reconsider much of the evidence afresh.

§ 5. PARTICULARS REGARDING HOXNE.

On my return from France, my attention was directed by Mr. EVANS to another case of a very remarkable character, described, so far back as the first year in this century, in a paper of great value for the independent and corroborative evidence it affords, and for the bold and suggestive views of the author. Although known to antiquaries, its geological bearings had escaped notice. It relates to a discovery made, and communicated to the Society of Antiquaries, by Mr. JOHN FRERE, F.R.S., F.S.A.‡, under

* Comptes Rendus, vol. xvii. p. 13, 1838.

† *Op. cit.* vol. ii. p. 178-9.

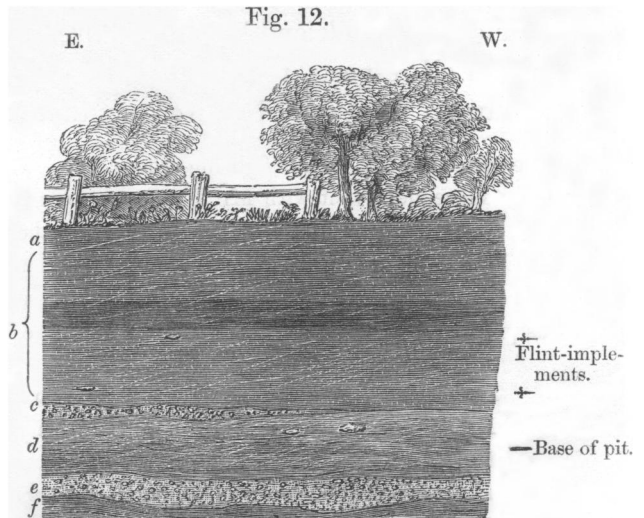
‡ Specimens of the Hoxne flint-implements have been preserved in the British Museum, and in the collection of the Society of Antiquaries. They closely resemble the French specimens. There is also in the British Museum another single specimen, singularly like some of the sharper-pointed specimens from Amiens. Respecting this specimen, I am indebted to Mr. FRANKS for the following particulars:—"Catalogue of Sloane Collection, No. 246—A British weapon found, with Elephant's tooth, opposite to Black Mary's near Grayes Inn Lane.—Conyers. It is a large black flint shaped into the figure of a spear's point—K." N.B. K probably means that this object was formerly in KEMP'S Collection (before 1715).

the title of "Account of Flint Weapons discovered at Hoxne in Suffolk*." The author stated that these weapons were found "in great numbers at a depth of about 12 feet," in a "stratified" gravelly soil underlying a layer of sand, containing shells and "some extraordinary bones, particularly a jaw-bone of enormous size of some unknown animal, with the teeth remaining in it." He also observed that the flint-weapons were so abundant, that they were used to fill in the ruts of the adjoining road. Mr. FRERE'S further observations show that he was of opinion that the ground was undisturbed, and that the strata had been partially denuded; and he considered that the specimens must be of very great antiquity,—possibly "*even beyond that of the present world.*" Excellent plates of two flint-implements, singularly like the lance-shaped specimens from Amiens, accompany the paper.

I lost no time in visiting Hoxne, a pretty village five miles eastward of Diss (Map, Plate XI.). The old brick-pit is about half a mile south of the village, on the road to Eye, adjoining the park and on the property of Sir EDWARD KERRISON. It is still worked, but the section is necessarily in some degree altered from what it was in Mr. FRERE'S time. (For section of pit, see Plate XI. sect. 2.) The present diggings show:—

Section in S.W. corner of Hoxne brick-field, 1859.

- | | | |
|---|----------|--|
| | feet. | |
| a. Surface soil, traces of sand and gravel... | 1 to 2 | |
| b. Brown and greyish clay, not calcareous, —used for brick-earth; with an irregular central carbonaceous or peaty seam. Two flint-implements are marked in the position assigned to them by the workmen, by whom they were found last winter† | 10 to 12 | |
| c. Yellow sub-angular flint-gravel, with a certain proportion of small chalk pebbles, and a few pebbles of siliceous sandstone, quartz, and other old rocks. Bones of <i>Mammalia</i> . The matrix of this bed, in places, consists of clay like b. It thins out to the westward ½ to 1 | | |
| d. Bluish and grey calcareous clay, in places very peaty; lower part with seams or partings of sand. <i>Wood</i> and vegetable remains. Land and freshwater <i>shells</i> . Bones of <i>Mammalia</i> ... | 3 to 4 | |
| e. Gravel like c, but smaller, more worn, and with more chalk pebbles | 1 to 2½ | |
| f. Calcareous grey clay, more or less peaty, with freshwater <i>shells</i> (I had a boring made in this bed to a depth of 17 feet, but no bottom was reached). | | |



I was fortunate in meeting with an old man who had worked in the pit since 1801.

* *Archæologia*, vol. xiii. p. 204, 1800. The original paper is as short as it is interesting.

† On my first visit I found no organic remains in this bed. The remains of the *Bos (primigenius?)* have since been found in it by the Rev. Mr. GUNN. And I have part of the socket of the tusk of an Elephant from the gravel c. These have been obligingly determined by Mr. QUEKETT (Nov. 1860).

On showing him a small ovoid flint-implement from Abbeville, he stated that many similar stones were formerly met with here, but that they were larger and more pointed*. Such specimens were now rare; only two had been found, at a depth of 7 and 10 feet from the surface in the clay (*b*), in the course of the preceding winter, and they had not been kept. However, after a short search in a rubbish heap, the men recovered one specimen†. Both in the gravel *c* and in the clay *d* bones of mammalia are still not unfrequently met with. I obtained a fragment of a rib of a Deer and part of the tooth of a Horse, and I afterwards saw, in the collection of Mr. T. AMYOT‡ of Diss, the astragalus of an Elephant, which from the matrix in its interstices evidently came from the bluish calcareous clay *d*. Pieces of wood, some of considerable size, are found in this latter bed. Amongst them may be recognized species of Oak, Yew, and Fir; together with small seed-vessels. In the lower part of this bed are thin seams or partings of sand full of shells, perfect but very friable, of the following recent land and freshwater species§:—

<i>Cyclas cornea</i> , Linn.?	<i>Helix nitidula</i> , Drap.?	<i>Planorbis albus</i> , Müll.?
<i>Pisidium amnicum</i> , Müll.	—— <i>hispida</i> , Linn.?	—— <i>spirorbis</i> , Linn.
<i>Unio</i> (fragmentary).	<i>Limneus palustris</i> , Linn.	<i>Succinea putris</i> , Linn.
<i>Bithinia tentaculata</i> , Linn.	—— <i>truncatulus</i> , Linn.?	<i>Valvata piscinalis</i> , Müll.

According to Mr. FRERE, the Flint-implements were discovered in gravelly soil underlying sand with shells and bones, and overlying a peaty clay. This would seem in some, but not in all respects, to agree with either *c* or *e* of the present section. Both overlie peaty clays||. The men, however, say that it is not in those beds, but higher up (in *b*)

* The men here call them "fighting stones."

† On a subsequent visit with Mr. EVANS we were more successful. We had a trench dug, on the east of the field, to the depth of 11 feet, and in examining the ground as it was thrown out by the men, Mr. EVANS discovered in the bed of gravel, No. 4, a flint-implement perfect except the point, which had been broken off by the pick of the workmen and could not be recovered. This trench, which was of further importance as proving the superposition of these beds to the Boulder Clay, gave the following section:—

	ft.	in.	
1. Ochreous sand and gravel, passing down into white sand	4	9	} 10 feet.
2. Seams of fine white and ochreous gravel	1	3	
3. Light grey sandy clay... ..	0	8	
4. Coarse yellow gravel in which the <i>flint-implement</i> was found	1	0	
5. Grey and brown clay with abundance of <i>Bithinia</i>	2	4	
6. Boulder Clay	1	0	

‡ I am much indebted to this gentleman's kind assistance and co-operation on my several visits to these pits.

§ The late Mr. JOHN BROWN, of Stanway, aided me in this collection. Most of the shells are so fragile and difficult to obtain perfect that several species have not yet been well determined.

|| My first impression was in favour of *e*: still there is an objection to placing them in gravel; for why, in that case, should they have been picked out to mend the roads with? The gravel itself would have been used as it was. It would rather seem from this that they were flints found accidentally in a bed of clay or sand, which was worked as such, and the flints picked out and thrown on one side. It is, however, possible that *c* may have been more argillaceous and overlaid by a local bed of sand (No. 3 of Mr. FRERE) with shells and bones, for beds of this character are liable to considerable changes, both in thickness and composition, within very short distances (Oct. 1860).

that they now find the flint-implements*. The gravel *e* is below all the beds worked. I had an excavation made in it, but without success; nor was my search in the other beds more successful on my first visit.

The Flint-implements I have seen in the collection of Mr. AMYOT and elsewhere, as well as those figured by Mr. FRERE, possess the same general characters, being rude, lance-shaped, and closely resembling one form from Amiens, only they are generally rather more slender and elongate (fig. 6, Plate XIV.).

The general evidence of this case certainly wants the completeness which the French deposits afford, but still there is every reason to believe it to be an analogous case. Unfortunately, the old part of the pit is now worked out and overgrown, but it is to be hoped that a full and efficient exploration of this interesting spot may some day be made. Mr. EVANS and I had several trenches dug, but much more is yet required. In one on the south side of the field, the brick-earth (*b*) was only 4 feet thick, and was overlaid by 3 to 4 feet of ochreous drift sand and gravel, and underlaid by $2\frac{1}{2}$ feet of small gravel (composed in great part of small chalk pebbles) resting upon a grey clay. The other trench, on the east side, exhibited a bed of yellow sand with a few flints, $3\frac{1}{2}$ feet thick, passing into ochreous gravel 1 foot, and under it a seam of grey clay 1 foot thick, and then another bed of gravel, at the top of which we were stopped by water. At a distance of 150 yards from this spot, and on the other side of the small stream, is a pit in which the Boulder Clay is dug and where no other beds are exposed.

This Boulder Clay caps all the hills around and forms a low table-land, through which the small valleys are cut. Its very uneven base rests on white and yellow sands and gravel (5). In places, however, thick beds of ochreous and ferruginous subangular flint-gravel, with subordinate beds of sand, form low hills subtending the main plateau along the valley of the Waveney. This gravel (2) is newer than the Boulder Clay against which it usually slopes off, running, in thin patches, up some of the lateral valleys (see Plate XI. sect. 3).

The top of the freshwater deposit of Hoxne reaches within 6 or 8 feet of the summit of the hill, of which it forms an unbroken and uniform part. The adjacent hills are of about the same height, and there is no ground above a few feet higher for some miles around. No existing drainage, nor any possible with this configuration of surface, could have formed these clay and gravel beds, at the relative level they now occupy†.

The presence and abundance of perfect shells of *Valvata* and *Bithinia*, and the quantity of vegetable matter, render it probable that these beds were accumulated by a slow stream, or in a small marshy lake or mere, into which land shells, the remains of land

* Other specimens have since been found in the lower part of *b*, and one in the gravel (probably *e*). 1860.

† Since writing the above, I have had the pit, and the intermediate ground to the Waveney, levelled. The top of the pit proves to be 42 feet above the adjacent brook, 53 feet above the Waveney, and 112 feet above the sea. With Sir EDWARD KERRISON's courteous permission, we also had several trenches dug in the park to trace the extension of the Freshwater Deposit. The results of these operations are embodied in the plans and sections, Plate XI. Altogether there have been sixteen trenches and borings made in and around the pit.—October 1860.

animals, and drifted wood were carried down. The materials of this freshwater deposit are mainly such as would be produced and sorted by the slow wearing away of the Boulder Clay. The clays and marls, and the associated flint-gravels, with the pebbles of chalk, of quartz, and of hard sandstone, are materials just such as the artificial washing of the adjacent boulder clay now produces in the same field—a pure calcareous clay on the one hand, and a heap of rough gravel of flints, and older rock pebbles, on the other. The level of the Boulder Clay in the adjacent field is lower than the brick-pit, whilst elsewhere around it rises higher. The irregular patches of sand and gravel on the top of the whole are not of local origin, but belong, I believe, to the general superficial drift of the district. A portion of the freshwater deposit has suffered denudation,—a denudation evidently of the date of that which formed the small valley running down by Hoxne to the Waveney, and connected with the general valley system of the district.

This Hoxne section furnishes us with an important clue to the relative age of these several flint-implement-bearing deposits. As far as we can now judge, it is clearly newer than the Boulder Clay, and is probably older than some portion of the superficial sands and gravels. Probably of the same age, and much resembling the Hoxne deposit in many of its details*, are the deposits at Mundesley, Copford, Lexden, and others in the South of England. They were all formed before the country had assumed exactly its present form of surface,—before all its variety of hill and dale had been fashioned to their present shape. Even should the exact position of the worked flints at Hoxne prove to be above all the bone-bearing beds, and not in them, still that they are contemporaneous with an old condition of surface, and that over the whole is spread a drift concomitant with a modification of that surface, and giving the stamp to some of the present minor features of the country, is in either case, a very remarkable fact.

§ 6. GENERAL CONCLUSIONS.

From the foregoing considerations I cannot do otherwise, concerning the material facts, than come to the conclusions, agreeing essentially with M. BOUCHER DE PERTHES and Dr. RIGOLLOT†, that—

1st. The flint-implements are the result of design and the work of man.

2ndly. That they are found in beds of gravel, sand, and clay which have never been artificially disturbed.

3rdly. That they occur associated with the remains of land, freshwater, and marine Testacea, of species now living and most of them yet common in the same neighbourhood, and also with the remains of various Mammalia,—a few of species now living, but more of extinct forms.

* In company with Mr. EVANS, I have since found a similar freshwater deposit at Athelington, in the same valley as, and five miles S.S.E. from, Hoxne. The deposit, although small, is interesting from the circumstance of the Boulder Clay being seen to pass under it, and from its being overlaid by 8 feet of ochreous gravel and sand.—September 1860.

† On the theoretical questions I differ materially from these gentlemen. I consider the Diluvial theory, as interpreted by them, to be inadmissible.

And further, 4thly. That the period at which their entombment took place was subsequent to the Boulder Clay period, and to that extent post-glacial; and also that it was amongst the latest in geological time,—one apparently immediately anterior to the surface assuming its present form, so far as it regards some of the minor features.

It is true that no remains of Man himself have yet been found,—that is still to be desired; but if it be admitted that the flint-implements are his work, the negative point becomes an argument of less value.

Whilst abstaining from any general hypothesis in explanation of the phenomena, there is, however, one point to which I must refer before concluding, although I cannot, at present, venture beyond a few generalities respecting it. It might be supposed that in assigning to Man an appearance at such a period, it would of necessity imply his existence during long ages beyond all exact calculations; for we have been apt to place even the latest of our geological changes at a remote, and, to us, unknown distance. The reasons on which such a view has been held have been, mainly,—the great lapse of time considered requisite for the dying out of so many species of great Mammals,—the circumstance that many of the smaller valleys have been excavated since they lived,—the presumed non-existence of Man himself,—and the great extent of the later and more modern accumulations. But we have in this part of Europe no succession of strata to record a gradual dying out of the species, but much, on the contrary, which points to an abrupt end, and evidence only of relative and not of actual time; while the recent valley-deposits, although often indicating considerable age, show rates of growth, which, though variable, appear, on the whole, to have been comparatively rapid. The evidence, in fact, as it at present stands, does not seem to me to necessitate the carrying of man back in past time, so much as the bringing forward of the extinct animals towards our own time; my own previous opinion, founded upon an independent study of the superficial drift or Pleistocene deposits, having likewise been certainly in favour of the latter view. There are numerous phenomena, which I can only consider as evidence of a sudden change, and of a rapid and transitory action and modification of the surface, at a comparatively recent geological period—a period which, if the foregoing facts are truly interpreted, would seem nevertheless to have been marked, before its end, by the presence of Man, on a land clothed with a vegetation apparently very similar to that now flourishing in like latitudes, and whose waters were inhabited by Testacea also of forms now living; while on the surface of that land there lived Mammalia, of which some species are yet the associates of man, although accompanied by others, many of them of gigantic size, and of forms now extinct.

APPENDIX.

(A.) Letter from JOHN EVANS, Esq., F.S.A., F.G.S., to the author, *on the Form and Nature of the Flint-implements*. Dated,—Nash Mills, Hemel Hempsted, May 25, 1859.

MY DEAR SIR,—In accordance with your wish I send you a few notes upon the flint-implements, or weapons discovered in the beds of drift which we lately visited together in the neighbourhood of Abbeville and Amiens, regarding them from an antiquarian rather than a geological point of view.

What appears to me of most importance, is to point out wherein these implements from the drift resemble or differ from those in some degree analogous with them, which are so frequently found in this country and on the Continent, and are usually considered to be the work of the primitive, or as for convenience sake I will call them, the Celtic inhabitants of this part of Europe.

The resemblances and differences may consist in material, form, or workmanship, and on each of these points I will say a few words.

1st. As to the material from which they are formed,—the flints derived from the chalk. This is the same as has been so extensively employed for the manufacture of weapons and implements by uncivilized man in all ages and in all countries where flints are to be found; the hardness of the stone and the readiness with which it may be fractured in such a manner as to produce a cutting edge, giving it a preference over all other stones, and in some instances having caused it to be sought for at a distance, when not found upon the spot, for the purpose of converting it into knives, axes, or arrow-heads. There is, however, this to be observed about the weapons or implements from the drift, that though they are found in a country abounding in flint, the stones from which they were formed do not appear to have been so carefully selected, nor to have been as free from flaws and imperfections as those employed for a similar purpose by the Celtic tribes. These latter also not unfrequently used other stones, as greenstone*, syenite, porphyry, quartz, jade and serpentine, as materials for weapons or tools, but those from the drift are, as far as has hitherto been ascertained, exclusively of flint.

2. As to form, there is for the most part a marked difference between the worked flints from the drift and those of the ordinary Stone period. The former may, for my present purpose, all be grouped under three heads:—

1. Flint flakes, apparently intended for arrow-heads or knives.
2. Pointed weapons, analogous to lance or spear heads.
3. Oval or almond-shaped implements presenting a cutting edge all round.

It is in the first-named class of implements *only* that there is any close analogy with those not unfrequently found with other remains of human art, which are considered to belong in this country to a period but slightly prehistoric. Wherever flint is used as a material for the formation of tools or weapons, many of the flakes or splinters arising from the chipping of the flint, will of necessity present sharp cutting edges, and are certain in consequence to be utilized. These flakes seem peculiarly well adapted for points of darts or arrows, or for cutting purposes, and for such have been used in all ages. But the very simplicity of their form prevents those fabricated at the earliest period

* Arch. Assoc. Journal, vol. ix. p. 65.

from being distinguishable from those of a later date; and as they are often produced even by a single blow, it is at all times difficult to discern those formed by the hand of man from those resulting from the accidental fracture of a flint by natural causes. For this reason, mere flakes of flint, however analogous to those we know to have been made by human art, can only be regarded as affording doubtful evidence of man's existence, unless found in sufficient quantities to prove design in their formation. The flint flakes you found in the sand at Menchecourt are in my opinion the work of man, as are also those found in some of the ossiferous caverns both in England and on the Continent; but granting them to be so, there is little or nothing in their form to distinguish them from those with which we are already acquainted.

The case is different with the implements of the second class—those resembling spear or lance heads in form. Of these there are two varieties; the one rounded at the point, its outline presenting a sort of parabolic curve; the other acutely pointed, with the sides curved slightly inwards. The edges of both kinds are to a certain extent made sharp, but not so much so as the points, and altogether they appear better adapted for piercing than for cutting. Both shapes are usually truncated at the base, and at that end frequently show the original form of the flint. It is of course impossible to say for what purpose they were intended; but they may have been attached to the end of poles so as to form spears or darts, or used without any handle for grubbing in the ground, or as wedges for splitting wood. I know of no analogous form among the Celtic implements; some of the rudely chipped arrow-heads found in Ireland and elsewhere present the nearest approach to it, but are far smaller in size, the weapons from the drift being usually from 5 to 6 inches in length. The ordinary form of stone celt is, as you are aware, intended for cutting at its broad end, the narrow end being inserted in the socket of the handle; these, on the contrary, cut or pierce at the narrow end, while the broad end appears intended to rest against a stop or bracket, or to be held in the hand.

The third class, implements with a cutting edge all round, have also no correspondence with the usual forms. Their prevailing shape is an oval, more or less pointed at one end, and equally convex on both sides. They vary in length from 2 to 8 inches, but are usually from 4 to 6 inches long. There is also considerable variety in their form, probably owing to defects in the flints from which they were fashioned; and in fact the two classes into which, for convenience sake, I have divided these rudely-formed instruments, as distinct from the flint flakes, may be said to run one into the other; it being hard to determine to which of them some of the weapons are to be referred. Such of the Celtic implements as have a cutting edge all round, are more triangular in their form and are of very rare occurrence; those of the oval-shape, on the contrary, appear to be equally common in the drift with those of the spear head character, the oval form predominating near Abbeville, and the spear heads being most abundant at St. Acheul. The use for which they were intended is by no means apparent. They may, however, have been used as axes, or those of the smaller size possibly as sling-stones propelled either from the ordinary sling or the end of a cleft stick.

3. In point of workmanship, the implements of the two classes last described differ from those of the ordinary Stone period in several particulars. The majority of the latter show traces of having been ground and polished, wholly or in part; those from

the drift, on the contrary, have merely been roughly chipped out of the flint, and in no case ground. When from any cause the former have been left as originally chipped out, it will be found in most instances that the chipping process has been executed with much greater nicety, and the chips or splinters removed have been much smaller than those from the weapons found in the drift. Rude as the ordinary stone implements may appear, they seem to point to a higher degree of civilization than those I am now considering. Who the people were that formed them, at what period they lived, and in what manner these their memorial stones became imbedded in the mass of drift in which they are now discovered, must, I am afraid, ever remain a matter for conjecture. But that these weapons and implements form as much an integral part of the deposit in which they are found as any other of its constituent flints or pebbles, I for one am convinced. The undisturbed state of the beds of sand and gravel, the incrustations upon some of the worked flints (identical with that upon the other flints in the same bed, a really antique patina), the concurrent testimony of the workmen, the similarity of the discoveries at Abbeville and Amiens, thirty miles apart, the assurances of M. BOUCHER DE PERTHES, both verbal and printed, and lastly, our own observations, all convinced me that they were not at any subsequent period buried in the gravel, but were entombed in it with the remains of the Elephant, Rhinoceros, and other extinct mammalia, at the time when the agent was still in force by which these beds of drift were deposited. Had any doubts remained upon my mind, the discovery of identical weapons at Hoxne in Suffolk, in conjunction with similar remains of extinct mammals and in analogous drift, recorded moreover in the 'Archæologia' sixty years ago by an antiquary unfettered by geological theories, would have sufficed to have removed them. There appear to have been one or two other similar discoveries in England, and more would probably have been recorded, had not the rudeness of the workmanship of the weapons been such that they would hardly attract the eye of an ordinary observer, while those scientific persons who have been engaged in the investigation of the drift, have been more on the alert for fossil organisms than for traces of the hand of man. These diluvial beds will, however, now form a point of union on which both the geologist and the antiquary may prosecute their inquiries together; and on this neutral territory between Palæontology and Archæology a wide field is opened for investigation, which must eventually lead to a great extension of our knowledge of the history of primeval Man.

Believe me, my dear Sir, ever yours sincerely,

JOHN EVANS.

(B.) Extract from letter of Dr. H. FALCONER, F.R.S., F.G.S. &c., to the author, *descriptive of the result of his recent examination of the remains of the great extinct Pachyderms in the several collections at Amiens.* Dated Lyons, 21st October, 1860.

"1. In M. GARNIER'S private collection I saw two well-marked examples of molars of *Elephas antiquus*; the one a magnificent specimen of the last true molar, lower jaw left, composed of fourteen collines to the crown, all more or less worn. The characters are so pronounced that I would have selected it as a typical illustration of the species for a drawing. The specimen was stated by M. GARNIER to be from St. Roch. There was one peculiarity about it deserving consideration, that tested by '*l'happement à la langue*;'

it was highly absorbent, *i. e.* cleared out of its gelatine. It was in several pieces, but the outer layer of cement was entire, and the specimen as a whole bore no indications of having been rolled along with gravel.

"2. In the same collection, a very fine first true molar, upper jaw, also of *Elephas antiquus*, composed of the eight anterior collines; the talon and two front ridges worn, the rest intact. The crown completely denuded of the shell of enamel, and *may have been rolled*; mineral condition *highly absorbent*. This specimen, M. GARNIER informed me, came out of the same deposit as 'les haches,' *i. e.* St. Acheul.

"3. Museum of the Jardin des Plantes. A very fine series of molars and other remains of *Elephas primigenius*, from the gravel of St. Roch. In mineral condition wholly different from No. 1, *i. e.* the enamel *glistening and pearly* like that of a modern tooth; plenty of gelatine, and no great '*happement à la langue*.' They are reputed to be from the gravel deposit of St. Roch. The surface white, as if out of chalk rubble.

"4. Among these were two superb last lower molars of *Elephas primigenius*, one of them perfectly entire, and a model specimen for an illustration. The outer shell of cement of these specimens, although in the fossil state, a soft tender material, which readily yields to '*frottement*' when rolled with gravel, was perfectly entire, just as if it had been imbedded in a tranquil lacustrine deposit. At the Jardin des Plantes I saw not a trace of *Elephas antiquus*, either from St. Roch or St. Acheul.

"The other principal remains in the same collection were of *Rhinoceros tichorhinus*, lower jaws and molars, upper and lower; not a trace did I see either of *Rhinoceros hemitechus* nor of *Hippopotamus major*; and if I remember right, the tusks which you had of the latter form, adhered strongly to the tongue."

(C.) Extract from letter of M. BAILLON to Dr. RAVIN (*op. cit.*) in Mém. Soc. Roy. d'Emulation d'Abbeville for 1834-35, p. 197.

"On commence à trouver des ossemens à 10 ou 12 pieds de profondeur dans les sables de Menchecourt; mais on en trouve une bien plus grande quantité à 18 et 20 pieds. Il y a de ces ossemens qui furent brisés avant d'être enfouis et d'autres dont les angles sont arrondis sans doute parce qu'ils ont été roulés par les eaux; mais ils ne sont pas enterrés aussi profondément que ceux qui sont demeurés intacts. Ceux-là sont déposés au fond de la sablière: ils y sont entiers, sans brisure ni frottement, et il est probable qu'ils étaient encore articulés quand ils ont été recouverts. J'y ai trouvé tout un membre postérieur de rhinocéros dont les os étaient encore dans leur situation relative ordinaire: ils ont dû être joints par des ligamens et même entourés de muscles à l'époque le leur enfouissement. Le squelette entier du même animal gisait à peu de distance."

(D.) Extracts from letter of M. BOUCHER DE PERTHES, President Soc. d'Emul. Imp. d'Abbeville, to the author, on his request for *a rough approximate estimate of the number of Flint-implements (Haches) found near Abbeville*. Dated November 1860.

"Il m'est bien difficile de vous dire combien j'ai trouvé de haches.....Mes reponses sur le nombre des haches de chaque localité ne sont que des indications."

“ Les haches bien caractérisées ont toujours été rares à Menchecourt ; je n'en ai pas trouvé moi-même plus d'une douzaine, et les ouvriers ne m'en ont pas apporté plus d'une quarantaine, peut-être moins. Si vous admettez que ces ouvriers ont porté ailleurs une trentaine d'autres haches, vous arrivez à presque une centaine recueillie en 20 ans.

“ A St. Gilles elles sont encore plus rares ; j'en ai trouvé une vingtaine de roulées et très grossières, mais de bien faites pas plus que 10 à 12 ; les ouvriers peut-être en ont ils recueilli autant.

“ A Moulin Quignon on en a trouvé accidentellement quelques douzaines ; puis on est resté des mois, des années, sans en trouver une seule : je ne parle pas des roulées et très grossières, on en trouve toujours. J'estime de 150 à 200 haches bien taillées celles qui y ont été recueillies ; dont une trentaine par moi, dont il n'y a que 7 à 8 de bien taillées ; la plupart des autres ont été trouvées devant moi : quand je n'étais pas là les ouvriers ne les voyaient pas, ou ne les ramassaient pas, et après le travail je les recueillis dans la tranchée ou dans les tas de silex amoncelés sur les bords.

“ Quand plus tard on fit les travaux du Champ de Mars une vaste partie du banc diluvium fut mis à découvert : là on trouva des haches par centaines—400 à 500, peut-être plus.

(E.) I am indebted to Mr. RUPERT JONES and Mr. PARKER for an examination of the sands and clays of the Abbeville and Amiens deposits, in order to determine whether they contained microscopic entomostraca or foraminifera. With the exception of one doubtful specimen, they found no recent forms, but the list of derived specimens is interesting.

AMIENS.		ABBEVILLE.	
c. Sand. St. Acheul.		c. Loam. Menchecourt.	
<i>Rotalia Clementiana</i> , d'Orb.	} Chalk.	<i>Rotalia Corderiana</i> , d'Orb.	} Chalk.
<i>Cytherella ovata</i> , Rœmer.		<i>Rotalia Clementiana</i> , d'Orb.	
<i>Rotalia ammonoides</i> , var., Reuss.	} Tertiary ?	<i>Rotalia umbilicata</i> , d'Orb.	} Tertiary.
<i>Candona</i> , sp. (recent ?)		<i>Rotalia ammonoides</i> , var. Reuss.	
d. Gravel. St. Acheul.		d. Sand. Menchecourt.	
<i>Rotalia Clementiana</i> , d'Orb.	} Chalk.	<i>Rotalia Clementiana</i> , d'Orb.	} Chalk.
<i>Bulimina variabilis</i> , d'Orb.		<i>Rotalia Micheliniana</i> , d'Orb.	
<i>Cytheridea Muelleri</i> , Munst.	} Tertiary.	<i>Rotalia umbilicata</i> , d'Orb.	
<i>Cythere scrobiculata</i> ?, Münst.		<i>Bulimina variabilis</i> , d'Orb.	
<i>Polystomella crispa</i> , Linn.		<i>Cristellaria rotulata</i> , Lamarck.	
		<i>Rotalia Beccarii</i> , Linn.	Tertiary.

From the Foraminifera and Entomostraca above enumerated, it appears that the sands, &c. referred to, were mainly derived from the chalk, and received additional materials from some tertiary beds.

(a—f). 6 Foraminifera from chalk (11 occurrences)	} { Chalk 12 occurrences. Tertiary 7 occurrences.
(x—y). 3 Foraminifera from tertiary sources (4 occurrences)	
(1). 1 Entomostrakon from chalk (1 occurrence)	
(i—iii). 3 Entomostraca from tertiary sources (3 occurrences)	

(In some of the clays and gravels of Hoxne I have also seen derived or extraneous Foraminifera, but they yet require working out.—J. P.)

(F.) Levels around Abbeville referred to in the paper. As the mètres are there reduced to English feet, I here give the copy of the original document, for which I am obliged, through M. BOUCHER DE PERTHES, to the Engineers "des Ponts et Chaussées."

Designation des Carrières.		Plus hautes eaux de retenues artificielles de la Somme en 1857.	Hautes eaux extra- ordinaires de la Somme en 1841.	Marées extraordi- naires de vives eaux au port de St. Valery.	Niveau moyen de la Mer	
					à St. Valery sur Somme.	au Havre.
		mètres.	mètres.	mètres.	mètres.	mètres.
Carrière de cailloux à l'extré- mité, côté gauche, du fau- bourg St. Gilles.....	Terrain naturel au sommet de la Carrière	21·95	21·41	20·55	27·02	29·16
	Partie nivelée du terrain exploité.....	19·95	19·41	18·55	25·02	27·16
Carrière de cailloux de la porte du bois près le Mou- lin Quignon	Terrain naturel au sommet de la Carrière	27·15	26·61	25·75	32·22	34·36
	Partie nivelée du terrain exploité.....	25·15	24·61	23·75	30·22	32·36
Sommet de la butte du Moulin Quignon		31·11	30·57	29·71	36·18	38·32
Carrière de sable de Menche- court appartenant aux S ^{rs} Dufour et Coulombel ...	Terrain naturel au sommet de la Carrière	12·97	12·43	11·57	18·04	20·18
	Partie nivelée du terrain exploité et en culture ...	7·77	7·23	6·37	12·84	14·98
Tertre sur lequel est placé le moulin de l'argillière (Menche-court)		51·49	50·95	50·09	56·56	58·70
Sablères* appartenant au S ^r Papillon situées à Mautort à gauche de la route impériale No. 25 à l'entrée de celle qui conduit à Gamaches		Le centre de cette carrière se trouve à 6 mètres au dessus du niveau de la mer au Havre. (It is 2·50 mètres more to the top of the pit.)				
Le niveau moyen de la Somme est à 6·10 mètres au dessus du niveau de la mer au Havre.						
Le niveau de la vallée près la station du chemin de fer à Abbeville est à 7·60 mètres au dessus du niveau de la mer au Havre.						

Levels around St. Acheul, from a ground plan obligingly furnished by M. PINSARD.

	mètres.	English feet.	
Valley of the Somme near La Neuville	20·42	67	These heights are above the mean tide at Havre. To reduce them to the mean tide at St. Va- lery, deduct 2·14 mètres, or 7 feet.
The railway at La Neuville.....	25·33	83	
Midway between La Neuville and St. Acheul	37·16	122	
High road, suburb of Amiens, at junction with the Cagny road	32·09	105	
High road, in front of the Monastery of St. Acheul	44·57	146	
Mean surface at T. and F. Freville's pits	47·50	156	
High road, opposite by-road leading to the Cagny road	42·15	138	
Cagny road, end of the preceding by-road	51·64	169	
On the Cagny road, 273 yards south-east of last point	56·88	187	
The highest point of the hill, 5 furlongs south of the pits, on the road to Cottency ...	66·10	217	

(G.) M. BOUCHER DE PERTHES has found that the silt and peat beds of the valley at Abbeville contain near the surface mediæval remains; lower Roman remains; and, beneath all, Celtic remains (*op. cit.* p. 182 to 206). A trench at La Portelette showed—

	ft.	in.	
1. Made ground and alluvial soil.....	10		} ft. in. 39 6
2. Calcareous tufa, with traces of plants and bones (a small statuette and Roman coins ?)	6	6	
3. Bluish gray clayey sand, with ground flint and jade Implements, worked bones, and bones of Beaver, Bear, Boar, Deer, &c.	10		
4. Peat, enclosing Celtic sepultures, coarse pottery, and rude bone and flint-implements	10		
5. Muddy sand and over flint gravel, reposing upon an irregular surface of chalk	3?		

At a short distance from Porte Mercadé the silt and peat with mediæval coins and Roman remains are 20 feet thick, and overlies 2 feet of muddy sand, containing a mass of rude flint-implements and coarse pottery.

Section by M. PINSARD of a boring in the valley of the Somme at Amiens.

1. Vegetable soil and silt, with bones of Deer, &c.	7	6	} 31 feet.
2. Peat	8	8	
3. Gravel, very similar to that of St. Roch and St. Acheul (newer, on my view.—J. P.)	14	10	

* This level was taken in error for one I wished to have of the pit where the flint-implements have been lately found, on the slope of the hill on the road to Moyenville (see "Pits," Section 1, Plate X.).

EXPLANATION OF PLATES.

PLATE X.

A, B. Plans of the districts immediately around Abbeville and Amiens, showing the extent of the flint-implement-bearing deposits, and of the recent valley-deposits. The topographical part is copied from the French Ordnance Maps.

Outline map of part of the valley of the Somme, with some principal heights.

1, 3. Theoretical sections across the valley of the Somme at Abbeville and Amiens, showing the relative position and proportion of the beds, their relation to the present valley, and their level above the sea. (The gravel under the peat belongs to bed No. 1.)

2. Theoretical section through Abbeville parallel with the valley of the Somme.

PLATE XI.

Map of the district around Hoxne, showing the position and probable extent (the cross lines) of the flint implement-bearing deposit. The ground plan copied from Ordnance Map.

1. Levels of the ground from the river Waveney* to the road by the side of Hoxne brick-field. The levels of this and the following section were taken by Mr. ALGER of Diss.

2. Actual section across the Hoxne brick-field, showing the extent of the working, the relative position of the strata, and the relation of the deposit to the surrounding surface.

3. Theoretical section, showing the relation of the Hoxne deposit to the other strata of the district, and its conformity with the present surface.

PLATES XII. to XIV.

Specimens of the principal forms of Flint-implements: *a*, front view; *b*, side view.

From the neighbourhood
of Abbeville,—1, 2 and 3
from the collection of
M. BOUCHER DE PERTHES.

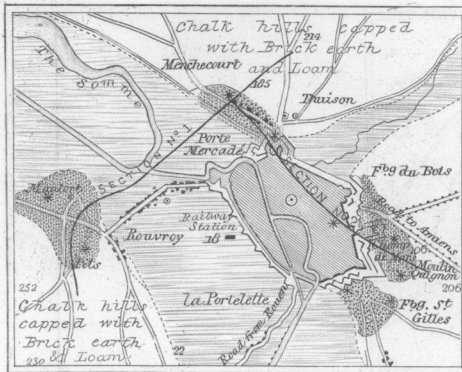
- Fig. 1. St. Gilles, in ochreous gravel; depth uncertain; colour,—light opake yellow.
- Fig. 2. Mautort, 1847; in marly gravel; depth uncertain; colour,—dull opake white; reverse side, flat, simple fracture.
- Fig. 3. Menchecourt; in sand (marl seam) *d*?; depth 26 feet; outer surface decomposed to a porcelain white.
- Fig. 7. Menchecourt, 11th April, 1859; in gravel *e* (fig. 2); depth 14 feet; original black colour of the flint unaltered; found by the author.

* The north end of this section is carried too far east on the Map. It should be direct along the road from B to A.

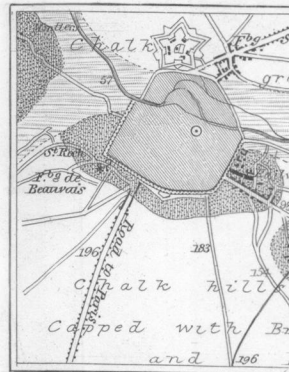
- From St. Acheul, Amiens. {
- Fig. 4. Found in the gravel *d* (sect. 6, p. 289), April 1860; depth about 24 feet; a small flint, with a thick white crust, a large portion of which remains, chipped at one end only; colour unaltered.
 - Fig. 5. Found in the gravel *d* (section, p. 292, near spot where Mr. FLOWER and the author found their specimens), June 1859; depth about 20 feet; black flint, original colour unaltered; vitreous lustre.
 - Fig. 8. Found in the gravel *d*, April 1859; depth uncertain; one side clear and but little altered, the other side slightly stained yellow, and partially coated with a film of carbonate of lime.
- From Hoxne Fig. 6. Found in the brick-earth *b*, 1852; depth uncertain; from the collection of Mr. AMYOTT; surface but little altered; more vitreous than in a freshly broken flint.

Note.—On Plate XL., beds No. 2, section 3, are represented too thick, whilst the line of base of the Boulder Clay (4) should be more irregular and higher.

A. ABBEVILLE.



B. AMIENS



Gravel & Sand with Mammalian

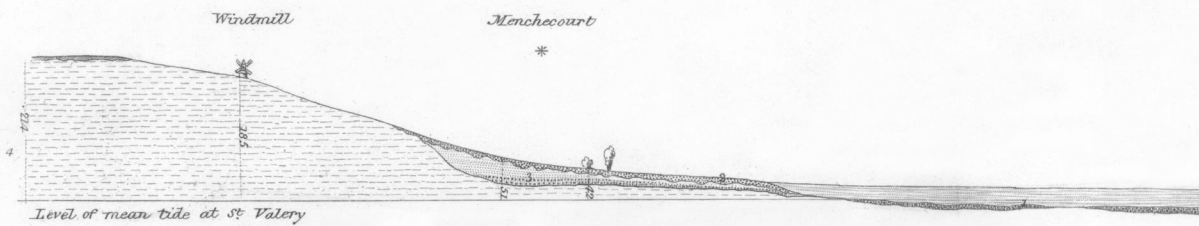
MILES.
KILOMÈTRES.

remains, & Flint Implements of

The numbers mark the heights in English feet

N.E.

I. SECTION ACROSS THE VALLEY



2. SECTION THROUGH ABBEVILLE

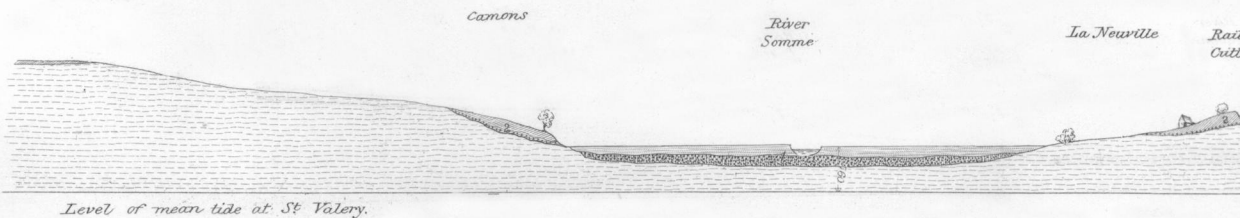
N.W.

ABBEVILLE



SECTION ACROSS THE VALLEY

N.E.



Level of mean tide at St Valéry.

1 Silt, Peat, & Gravel.

2 Brick-earth & angular flint-gravel

0 50 100

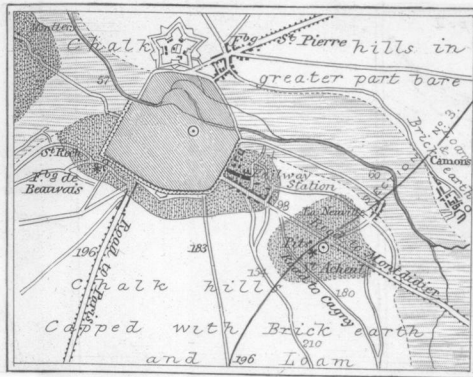
Ver

Horiz

1/4

B. AMIENS.

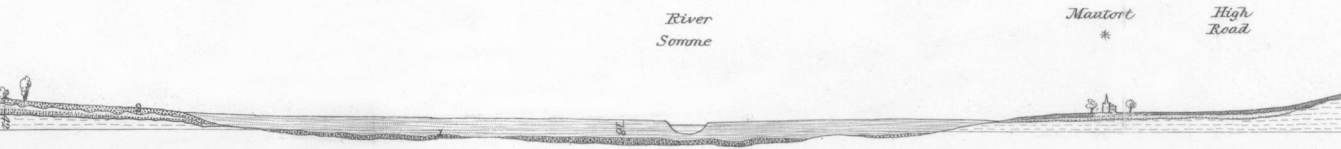
PART OF THE



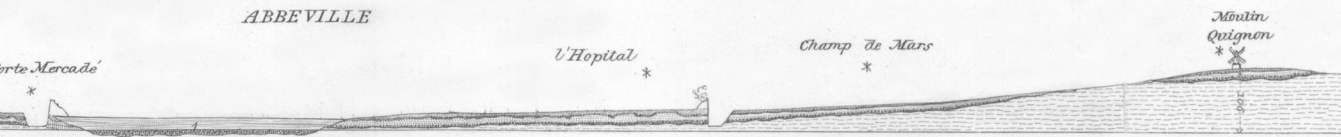
remains, & Flint Implements; at *.

The numbers mark the heights in English feet above the level of mean tide at St. Valery.

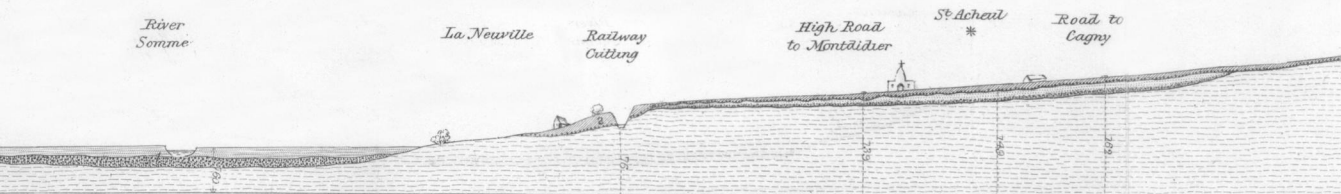
1. SECTION ACROSS THE VALLEY OF THE SOMME AT ABBEVILLE.



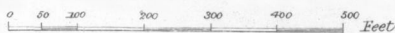
2. SECTION THROUGH ABBEVILLE FROM MENCHECOURT TO MOULIN QUIGNON.



SECTION ACROSS THE VALLEY OF SOMME AT AMIENS.



Vertical Scale.

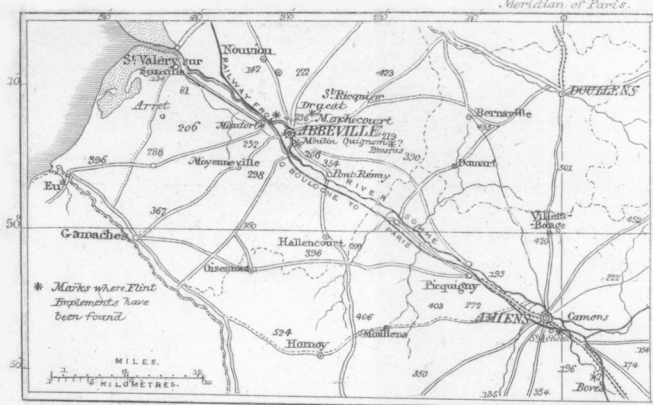


Horizontal Scale.



3. [Symbol]

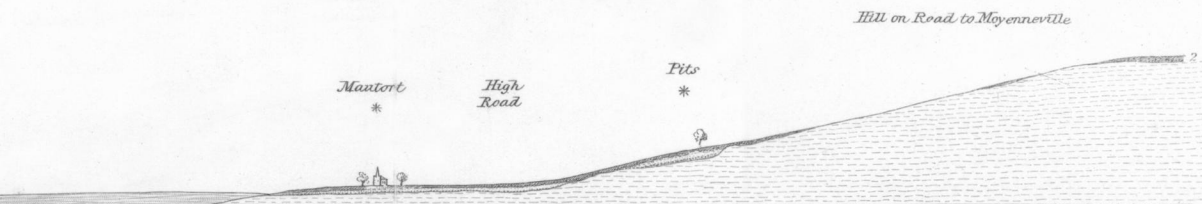
PART OF THE DEPARTMENT OF THE SOMME.



level or mean tide at St. Valéry.

THE SOMME AT ABBEVILLE.

S.W.



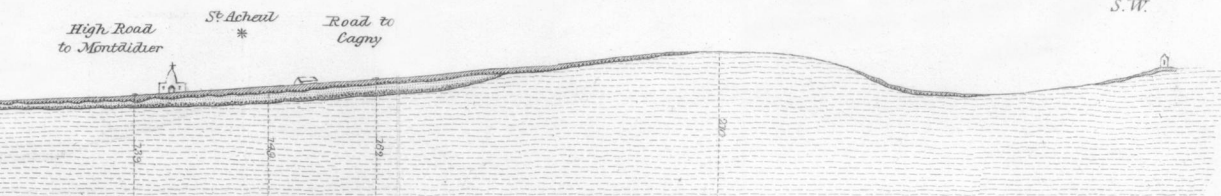
THE SOMME AT MENECHECOURT TO MOULIN QUIGNON.

S.E.



THE SOMME AT AMIENS.

S.W.

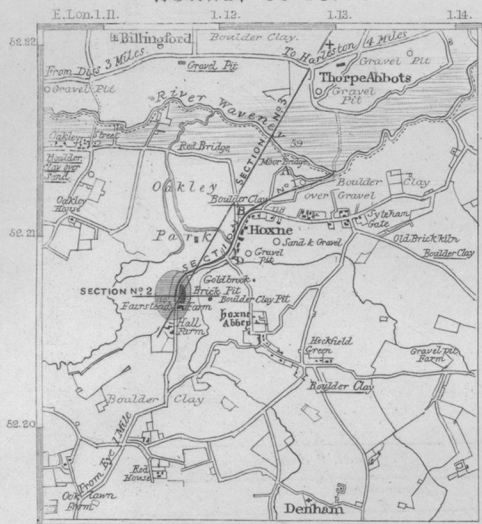


Scale.
400 500 Feet

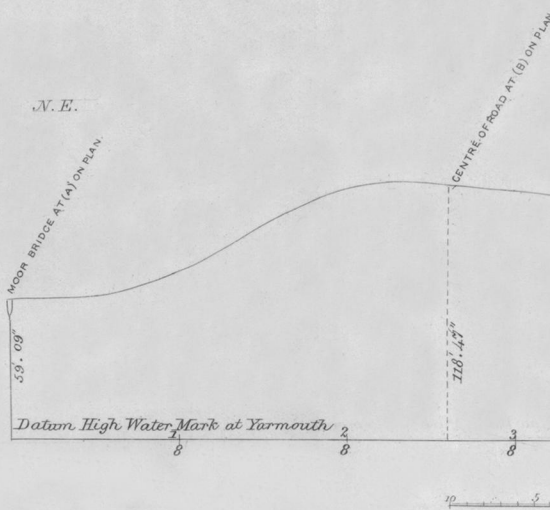
3. Fossiliferous sands, & gravel,
with Flint implements at *

4. Chalk.

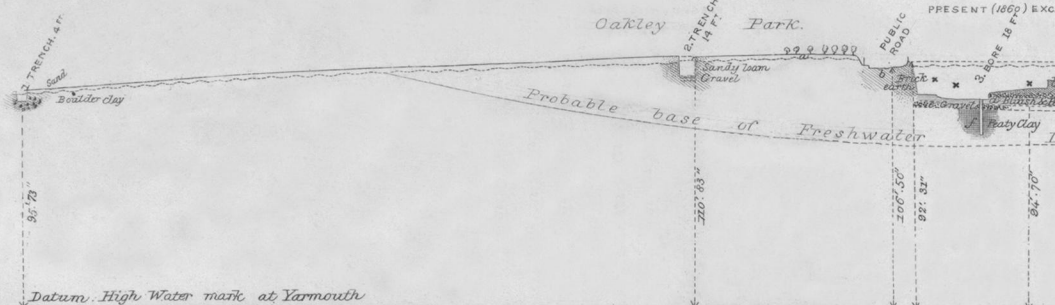
HOXNE, SUFFOLK.



1. LEVEL OF GROUND

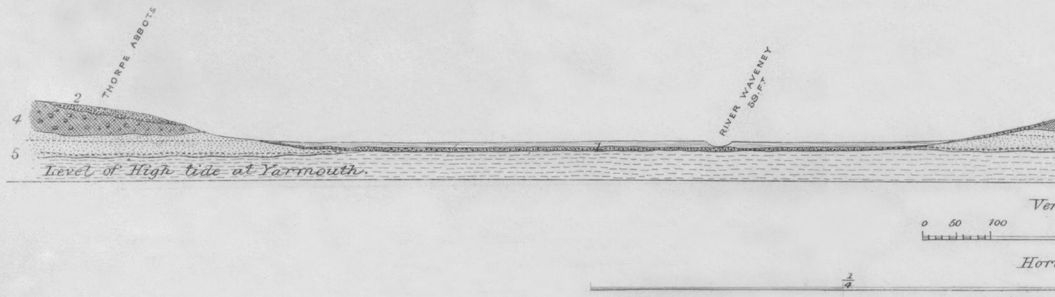


2. SECTION OF BR



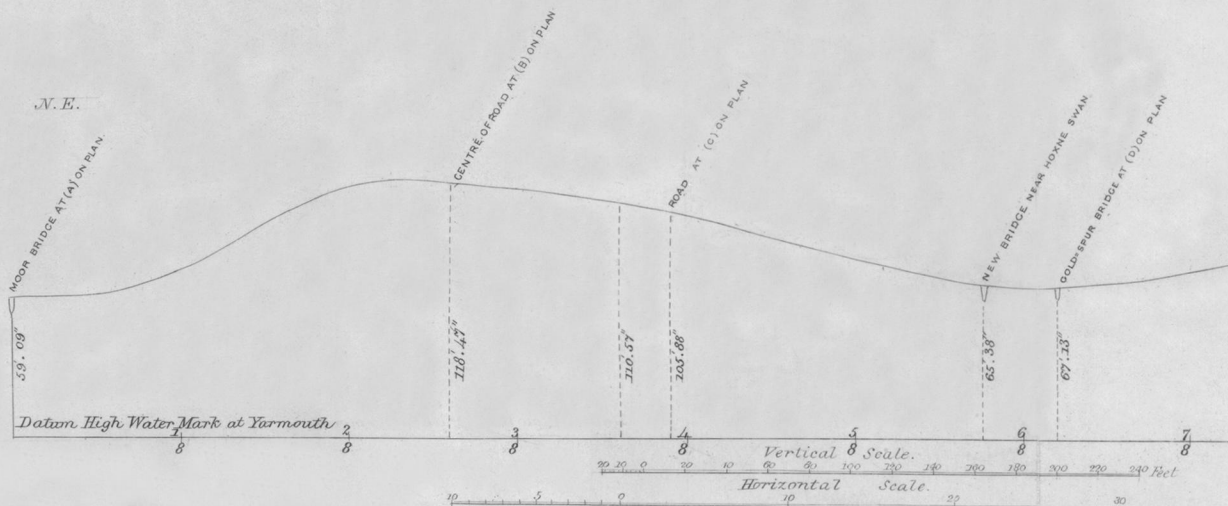
{ Flint Implements are found in b. & c. (at x.)
 { Mammalian Remains in b, c, & d.
 { Land & Freshwater shells in d. & f.

3. SECTION ACROSS THE VALLEY

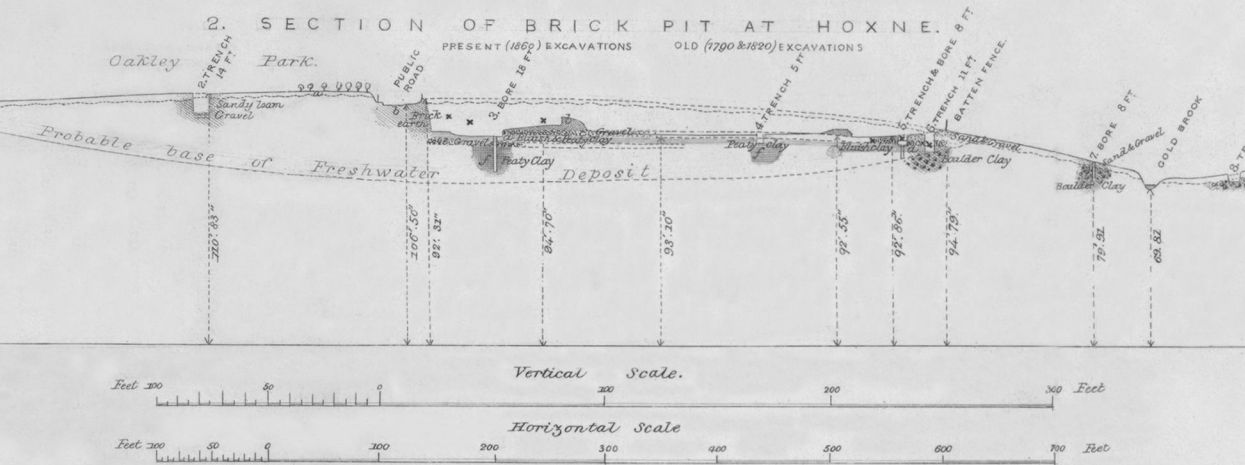


- 1 Silt, Peat, & Gravel.
- 2 Sand & Gravel.
- 3 Fossiliferous Clays & Gravels, with Flint Implements.

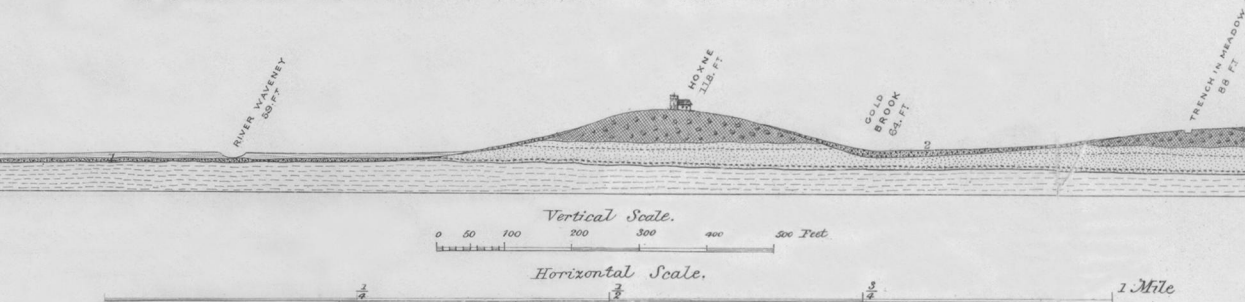
1. LEVEL OF GROUND FROM MOOR BRIDGE TO FAIRSTEAD



2. SECTION OF BRICK PIT AT HOXNE.



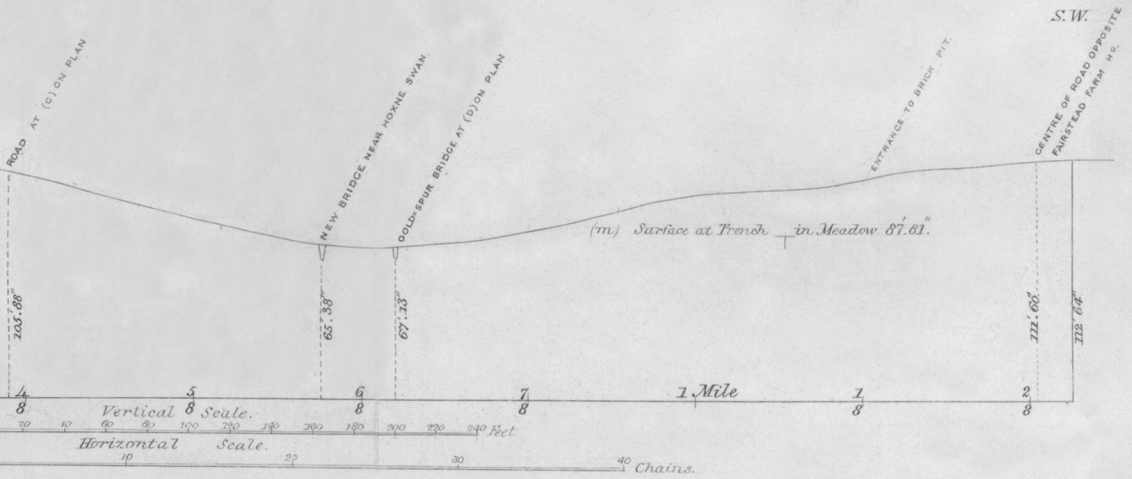
3. SECTION ACROSS THE VALLEY OF THE WAVENEY AT HOXNE.



- 3  *Fossiliferous Clays & Gravels,*
with Flint Implements.

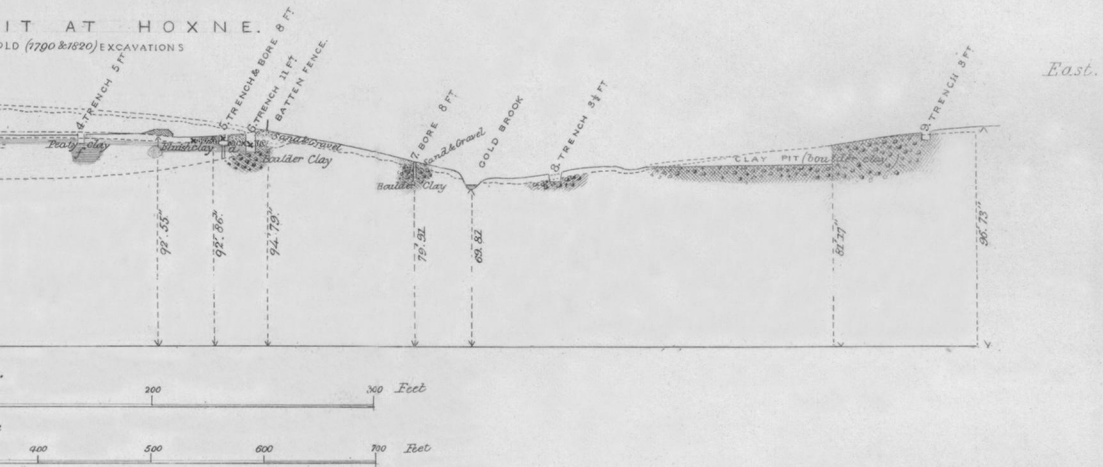
- 4  Boulder Clay.
- 5  Sands & Gravels.

M MOOR BRIDGE TO FAIRSTEAD FARM HOXNE.

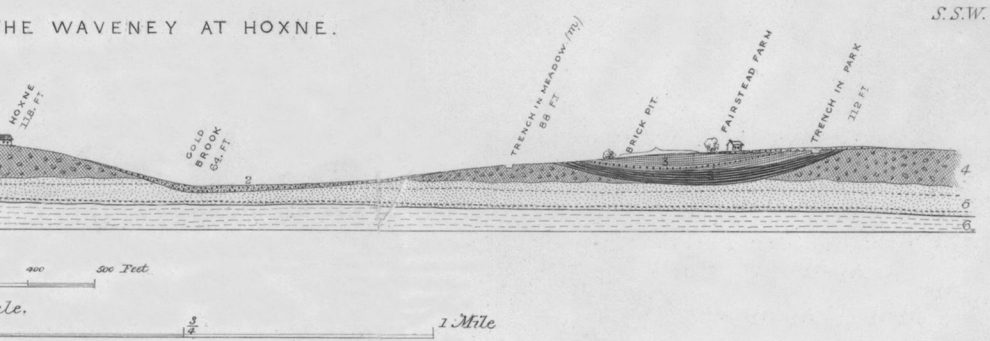


AT HOXNE.

OLD (1770 & 1820) EXCAVATIONS



THE WAVENEY AT HOXNE.



4 Boulder Clay.

6 Chalk—probable

5 Sands & Gravels.

position of.

J. Bastard.

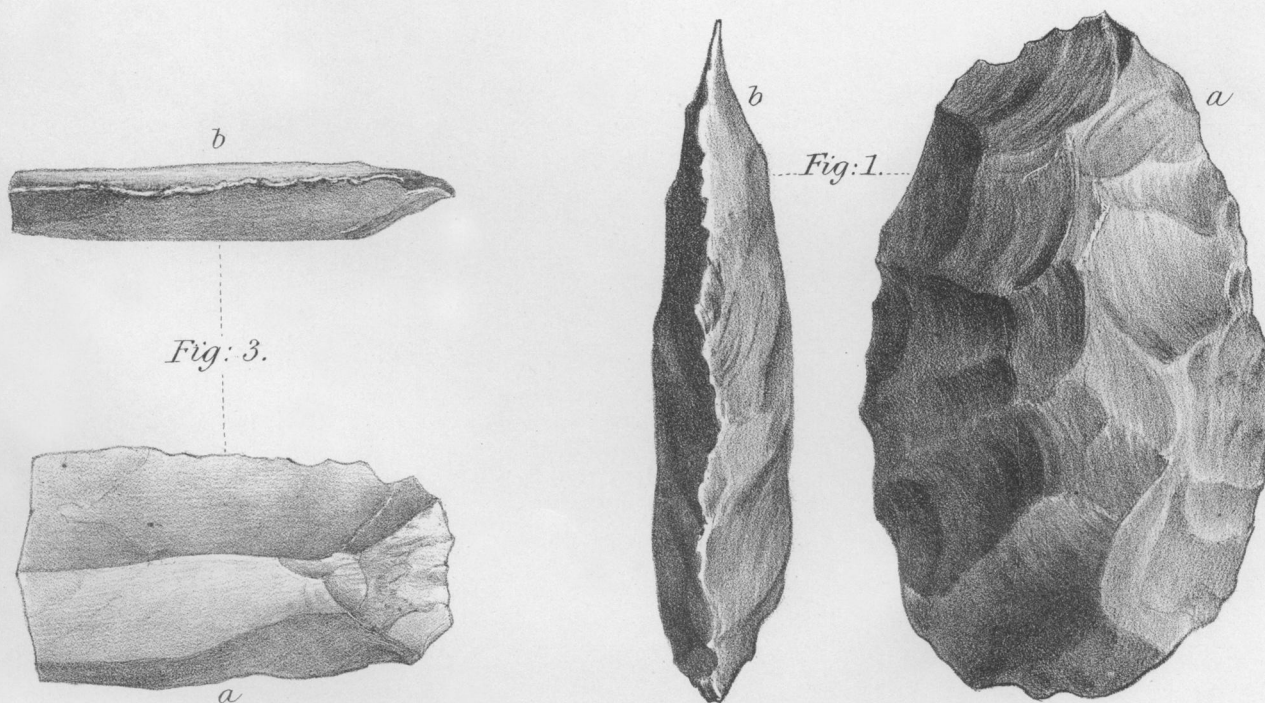
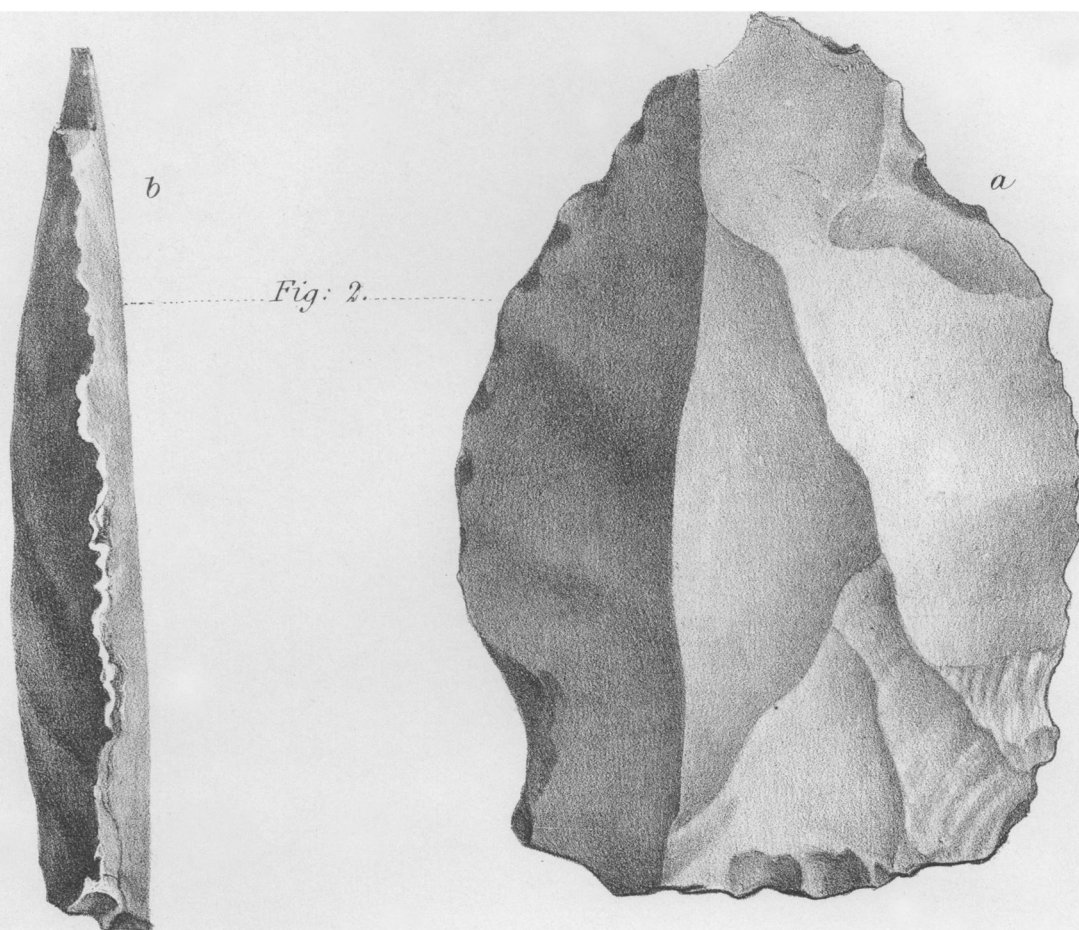
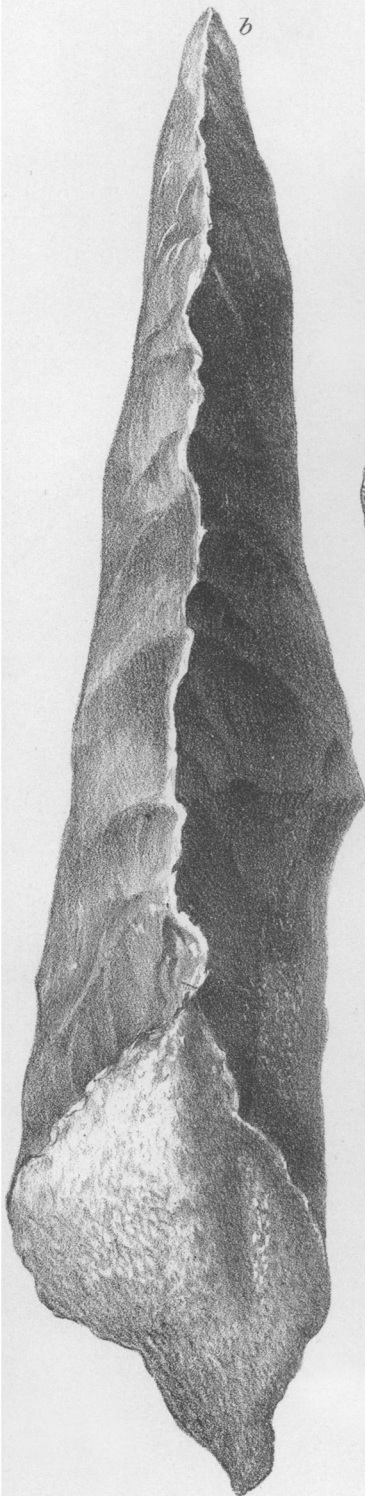


Fig: 5.



b

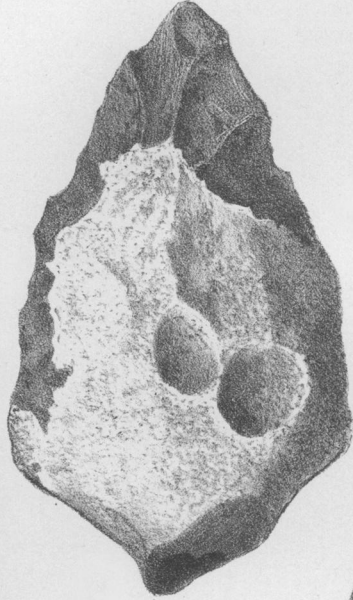


Fig: 4.

a



Fig: 5.



I. Scott, del.

*FLINT IMPLEMENTS,
Amiens.
Actual Size.*

J. Basire, lith.

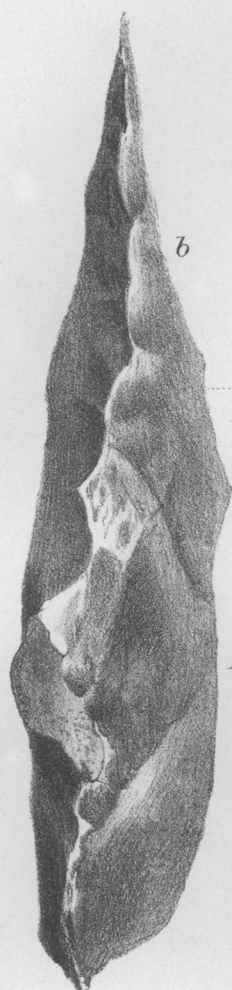


Fig: 6.

Actual size

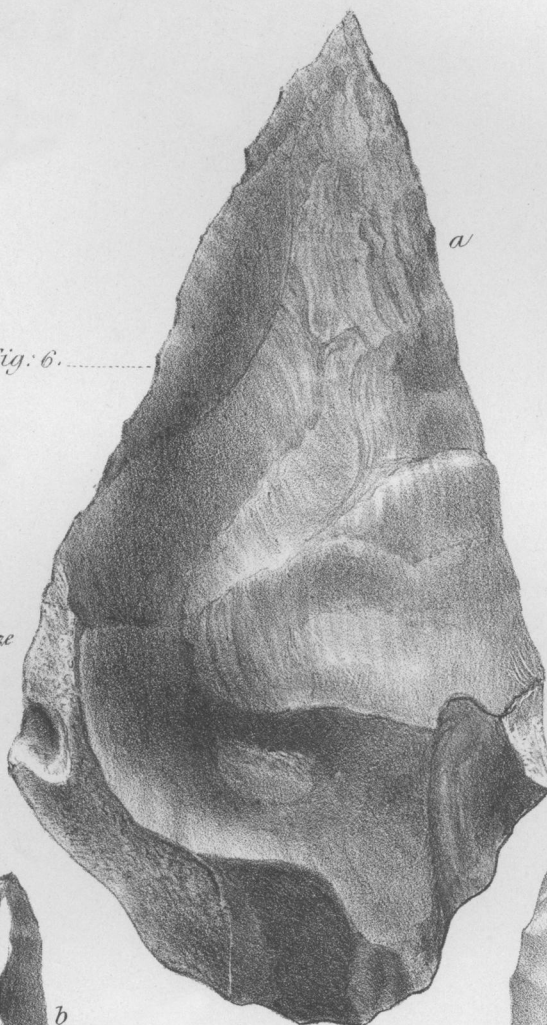


Fig: 7.



Scale $\frac{3}{4}$ Actual size.



Fig: 7.

Scale $\frac{3}{4}$ Actual size.

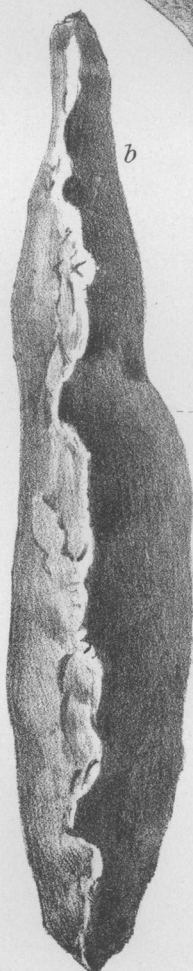
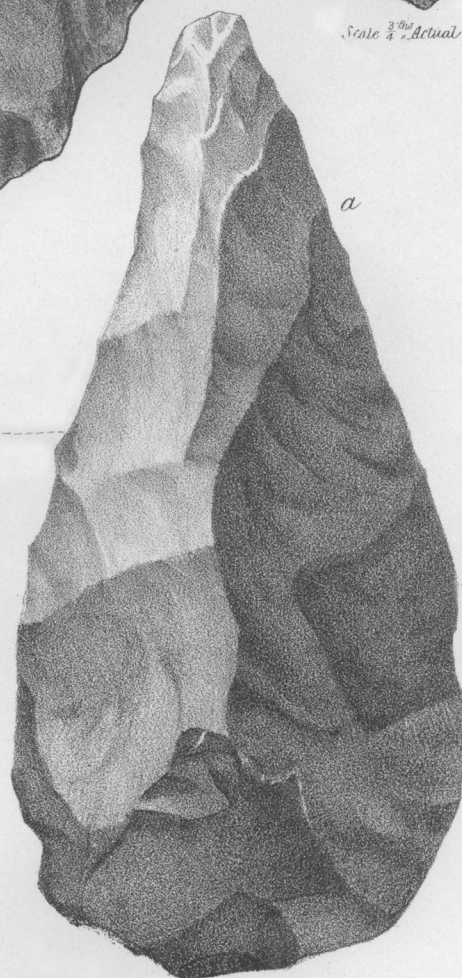


Fig: 8.

Actual size.



FLINT IMPLEMENTS.

Fig: 6. Hoxne;

Fig: 7. Abbeville.

Fig: 8. Amiens.

I. Scott, del.

J. Basire, lith.